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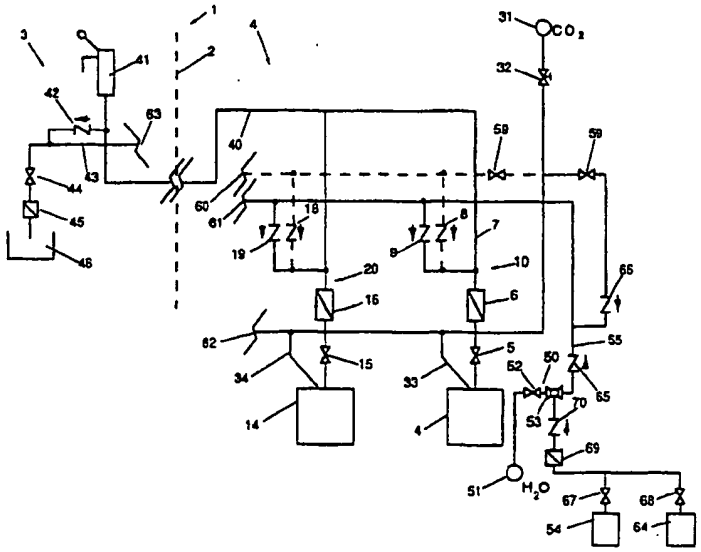

(57) Abstract

A gaz pressurized liquid delivery system. In particular but not solely for the dispensing of beverages such as beer, cider or stout. A logic circuit whether hard wired or computer or PLC controlled and wether centralized or distributed provides for the operation of the system. The run-out of an individual container in a series of containers is detected by means of a flow indicating means within a fluid pathway. The logic circuit then switches in another container in the series. The switching can be in order of connection to the circuit or an inputed manufactured date. Various cycles are provided by the logic circuit, for example, a cleaning cycle, sterilizing cycle and a purge cycle. These cycles are able to be enacted substantially automatically. A container e.g. keg connector is also provided. In at least a preferred form of the invention the said container connector contains a microprocessor forming or containing part of the above mentioned logic circuit.

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GAS PRESSURIZED LIQUID DELIVERY SYSTEM

FIELD OF THE INVENTION

This invention relates to apparatus for the dispensing of liquid from containers, the sterilization and/or cleansing of at least part of the dispensing apparatus and/or methods therefor.

BACKGROUND OF THE INVENTION

In the past, a number of inventions have been directed towards providing a liquid dispensing system, of these a number are directed towards providing for the switching of the container being dispensed from, eg. soon after a container has become empty, it is switched out of the circuit and a different full container, if one is available, is switched into the circuit. In particular, US Patent Specification No. 4,564,128 relates to a beverage dispensing system having a single source of pressure for a plurality of containers of a particular beverage and a dispensing line for each container communicating with a separate tap. The taps for a particular beverage are mounted together and each is provided with a lock, thereby allowing the operator to select which tap will operate at a given time and accordingly disable the other tap(s). The run out of a particular container must be protected by the operator, there is no provision of the automatic detection of the run out of a container and/or the automatic switching to dispensing from another full container.

Also disclosed in European Patent Specification No. 487214 is beverage dispensing system cleaning apparatus. However, the beverage dispensing system cleaning apparatus involves the disconnection of the connectors to the various containers and the provision of a flushing sleeve which is located upon the outlet of the beer taps. The beer taps must also be manually opened in order to provide an outlet for the cleaning fluid. It does not provide for the automated cleaning the beverage dispensing system.

In order to provide for the switching between a beverage container which is empty or nearly so and a container which is full it is useful to have a means to detect the build up of gas or absence of a liquid in a liquid supply line. To this end UK Patent Specification No. 1384607 provides means including a chamber a float within the said chamber said float supporting a first permanent magnet below a second permanent magnet which is located above and outside the chamber. The magnets being so oriented so that they mutually repel whereby movement in response to a movement in the magnet supported by the float results in a fluid signal from the fluidic device. This signal is used

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to provide an indication of the build up of gas or absence of liquid in the liquid supply. There is no provision of providing for the detection of liquid run out in a substantially unaltered conduit. There is further no disclosure of the use of electrical, in particular, solid state means to detect the run out of a liquid.

With a 'centralised' or downstream means of detecting the build up of gas, rather than detecting and control means at each container, it is not possible to avoid gas filled lines, which will cause frothing and dispensing problems when a new container is connected to that line, or will at least require additional means to bleed or otherwise remove the gas from the lines.

In practice such a system also requires providing means to prevent drawoff of liquid during changeover from a container which is empty to a container which is full ie. continuous drawoff of liquid during changeover is not possible.

BRIEF SUMMARY OF THE INVENTION

It is an object of the present invention to provide a gas pressurized liquid delivery system which provides for the switching between containers as the containers become empty and/or provides a substantially automated cleaning of said liquid delivery system, and/or provides selective fluid communication between multiple containers and multiple outlet taps and/or provides means of recording usage or consumption of containers and their contents and recording of cleaning operations.

As used in this specification gas pressurized liquid delivery system is defined to include:

(1) in a preferred form an above atmospheric gas pressurized system; or

(2) less preferably a pumped system (either motor driven or manually operated) which utilises an outlet (not necessarily at the bar or dispensing station) of substantially less than atmospheric pressure.

In and/or for a gas pressurized liquid delivery system, the use of

(I) an assembly connectable to a container from which liquid is to be expressed under gas pressure, **said assembly** being connectable into, to and/or about an opening of a said container and defining,

a fluid pathway having a fluid inlet connectable to receive a liquid being gas pressure moved up a conduit from adjacent the bottom of the container (if said assembly is not located adjacent the bottom of the container) from said container and a fluid outlet connected in use to or forming a fluid conduit,

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at least one remotely operable valve between said fluid inlet and the fluid outlet,

an inlet for a pressurizing gas and an outlet for the pressurizing gas or liquid at or adjacent said fluid inlet whereby a pressurizing gas can be provided in use at least into the container about said fluid conduit, and

flow indicating means within said fluid pathway (preferably between said remotely operable valve and said fluid inlet, and

(II) a logic circuit (hard wired and/or computer or PLC or computer AND/OR serial or parallel microprocessor(s) controlled where microprocessors are part of a centralised or distributed control network, and if microprocessor(s) are part of a distributed control network, microprocessor circuits are integral with said assembly and include means to sense and/or indicate said flow indicating means and control said remotely operable valve and optionally to sense and/or control and/or indicate liquid flow rate and/or liquid or room temperature and/or gas pressure in container or said fluid pathway) whereby:

in a first situation where said remotely operable valve has been opened and fluid is passing through said fluid pathway from the container associated with the assembly, said remotely operable valve is closed or allowed to close responsive to a signal from said flow indicating means (with or without additional logic input from or reference to a computer, microprocessor, PLC or other sensing means either remote or integral with assembly which may override such signal) of a fluid flow indicative of the container being empty or almost empty; and

in a second condition, where said remotely operable valve is closed but is in communication with a container to which the assembly is connected, and is opened or allowed to open (at least where there is a demand for the fluid of the system and subject to any additional logic requirement as aforementioned) and a like assembly has just halted fluid flow from another container under action from the logic circuit (as in the first condition aforesaid).

Preferably said assembly includes a second valve preferably interposed between said remotely operable valve and said fluid inlet and said gas inlet such that any pressurizing gas and container liquid can be shut off beyond said valve but both may be capable of being dispensed under the control of said remotely operable valve once said second valve is opened.

Preferably said flow indicating means within said fluid path way is as close as

possible to said fluid inlet.

Preferably said remotely operable valve is biased (eg. by spring or other means) to a closed condition when not being energized.

Preferably said remotely operable valve is a pilot operated two stage in-line electrically operated solenoid valve.

Preferably said flow indicating means are of an optical liquid sensor.

Preferably said flow indicating means comprises a solid state liquid level switch which utilises the principle of total internal reflection.

Preferably said flow indicating means comprises a solid state liquid level switch RS 317-819 available from RS Components, 12 Saunders Place, Auckland, New Zealand.

Preferably said logic circuit comprises a programmed computer or PLC or a combined computer and/or separate serial or parallel microprocessor(s) where microprocessors are part of a distributed control network.

Preferably said distributed control network consists (in part) of separate microprocessor circuits attached to each said assembly.

Preferably said programmed computer also includes a form of usage monitoring, recording and control and, optionally a system of automatic re-ordering, liquid flow, temperature and gas pressure monitoring and/or recording.

Preferably said computer program allows the said containers to be dispensed from in the order they are connected into the system alternatively said computer program allows said containers to be dispensed from in the order of manufacturing, ie. brewing. (The date of manufacturing being preferably read in from a bar code on said container).

Preferably said system also includes means to inject into said fluid pathways and/or assembly cleaning and/or optional sterilization means.

Preferably said cleaning means comprises a concentrated liquid or solid alkaline detergent substantially dissolved or mixed with water.

Preferably said optional sterilization means comprises concentrated liquid iodophors or hydrogen peroxide/peracetic acid solution or ozone substantially dissolved or mixed with water.

Preferably said concentrated cleaning and optional sterilizing means are injected and mixed into a flowing water stream by means of an injector/mixer without requirement for external pumping of the cleaning and/or sterilizing substances. Less preferably positive-displacement chemical feed pumps would be employed.

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Preferably said system includes means to purge said fluid pathway and/or assembly of fluid by means of a dispensing gas (or water) independent of the pressurizing gas into the container.

Preferably said system includes means to pre-rinse said fluid pathway and/or assembly with water prior to injecting cleaning means if purge is carried out with gas rather than water.

Preferably said independent dispensing gas is injected by means of pathways used to inject said sterilization and/or cleaning means. Alternatively, said independent dispensing gas is injected by means of pathways independent of pathways used to inject said sterilization and/or cleaning means.

Preferably said system includes means to flush from said fluid pathways and/or said assemblies the cleaning and/or sterilization means.

Preferably said assembly includes one way valve(s) to restrict the flow of container liquid but substantially not restrict the flow of said independent dispensing gas and/or said cleaning and/or sterilization fluid.

Preferably said assembly includes additional one way valve(s) to restrict the flow of said independent dispensing gas and/or said cleaning and/or sterilization fluid into the container.

Preferably said system includes means to re-prime said fluid pathways with fluid.

Preferably said means to purge, flush, prime and clean fluid pathways are controlled (with the ability to purge, flush, prime and clean individual or combinations of multiple lines as programmed), sequenced and recorded by the said computer programme or PLC or computer and/or serial or parallel microprocessor(s), in a centralised or distributed control network.

Preferably cleaning and flushing fluids are distributed by means of mains water pressure or where mains water pressure is insufficient by means of a pump.

Preferably cleaning and flushing fluids are utilised in a one-pass, non-recycling sequence. Alternatively, cleaning and flushing fluids are recirculated by means of a pump after mixing is completed.

Preferably the control system provides means to automatically terminate the purge and re-prime cycles.

In a further aspect the present invention consists in a liquid dispensing system having

an outlet tap operable at a liquid dispensing station (eg. a bar) to dispense liquid,

at least two kegs or other containers (hereafter "kegs" - the term keg being as hereafter defined),

conduiting means from said kegs to said outlet tap,

an remotely operable valve in said conduiting means at or adjacent each said keg,

gas pressurizing or pumping means (as defined) to pressurize the contents of each keg to allow the expressing of liquid therefrom into said conduiting means if allowed by said remotely operable valve and from there, if allowed, out of said outlet tap,

a liquid flow detector in said conduiting means at or adjacent each said keg, and

logic means (hard wired and/or computer or PLC or computer AND/OR serial or parallel microprocessor(s) controlled) where microprocessors are part of a centralised or distributed control network and if microprocessor(s) are part of a distributed control network, microprocessor circuits are integral with said assembly and include means to sense and/or indicate said flow indicating means and control said remotely operable valve and optionally to sense and/or control and/or indicate liquid flow rate and/or liquid or room temperature and/or gas pressure in keg or said fluid pathway) whereby in operation at least one of said remotely operable valves opens a passageway for liquid to move under gas pressure from a liquid containing keg under the control of said outlet tap, and whereby said remotely operable valve is closed or allowed to closed by said logic means responsive to an indication of a liquid flow from said keg indicative of the keg being empty and/or soon to be empty (and in satisfaction of any other logic requirements), said logic means or substantially simultaneously therewith opening or allowing the opening of an remotely operable valve of another keg such that there is a minimum of gas inflow into said conduiting means between each said remotely operable valve and said outlet tap.

By the term "keg" is meant individual kegs or movable or in-situ tanks or a grouping thereof connecting in series, or parallel to decant one into another or individually or simultaneously and from there into said conduiting means.

Preferably said conduiting means is connected into the top of each said keg or to the bottom of a tank (such tank having no internal fluid pathway to move liquid from adjacent the bottom of the tank to the opening of the tank).

Preferably each said keg is provided with an internal conduit from adjacent the bottom thereof (if said connection is not located adjacent the bottom of the keg) to the connection with said conduiting means, said connection allowing gas inflow into the keg

about such internal keg conduiting and the upflow of liquid from such a keg responsive to said gas pressure when such flow is permitted by a said outlet tap and/or the associated remotely operable valve.

Preferably an additional valve is provided at or adjacent each such keg such that said conduiting means can be closed independent of said remotely operable valve, eg. as might assist during the adding of fresh kegs or the removal of empty kegs from the battery of kegs.

Preferably said conduiting means is preferably a common conduiting means for each keg to be connected in sequence, etc as permitted by the logic means to a particular outlet tap or taps.

Preferably said conduiting means includes a valved connection to a washing fluid circuit and said connection to said washing connection circuit is permitted by said logic means only when each said remotely operable valve is closed, and

In another aspect the present invention comprises apparatus capable of producing a system as described above.

In another aspect the present invention comprises an assembly connectable to a container from which liquid is to be expressed under gas pressure (or pumped as defined), said assembly being connectable into, to or about an opening of said container and defining

a fluid pathway having a fluid inlet connectable to receive a liquid being gas pressure moved up a conduit from adjacent the bottom of the container (if said assembly is not located adjacent the bottom of the container) from said container and a fluid outlet connectable in use to a fluid conduit;

at least one remotely operable valve between said fluid inlet and fluid outlet;

an inlet for a pressurizing gas and an outlet for the pressurizing gas or liquid at or adjacent said fluid inlet whereby a pressurizing gas can be provided in use at least into the container about said fluid conduit, and

flow indicating means within said fluid pathway.

Preferably said flow indicating means is located between said remotely operable valve and said fluid outlet or inlet and preferably as close as possible to said fluid inlet.

Preferably said flow indicating means comprises a optical liquid sensor.

Preferably said optical liquid level sensor utilises the principle of total internal reflection.

Preferably said liquid level sensor comprises a solid state liquid level switch RS 317-819 available from RS Components Limited, 12 Saunders Place, Auckland, New Zealand.

Preferably an inlet for a sterilizing or cleansing liquid and/or gas and an outlet for said sterilizing or cleansing liquid and/or gas whereby a cleansing or sterilizing liquid and/or gas may be routed through at least part of said fluid pathway.

Preferably a one way valve is provided between said inlet for sterilizing or cleansing liquid and/or gas and said outlet for gas or liquid.

Preferably a one way valve is provided between said inlet for pressurizing gas and said outlet for pressurizing gas or liquid.

Preferably said assembly is connectable into a logic circuit whereby in a first situation where said remotely operable valve has been opened and liquid is passing through said fluid pathway from a container associated with the assembly, said remotely operable valve is closed or allowed to close responsive to a signal from said flow indicating means (with or without additional logic input) of liquid flow indicative of the container being empty or almost empty.

In yet another aspect the present invention consists in a method of cleansing and/or sterilizing a liquid dispensing system, said liquid dispensing system dispensing from at least one container, said container being connected into said liquid dispensing system by means of a connector, said connector having:

a fluid pathway having a fluid inlet connectable to receive a liquid being gas pressure moved (or pumped as defined) up a conduit from adjacent the bottom of said container (if said connector is not located adjacent the bottom of the container) and a fluid outlet connectable in use to a fluid conduit;

at least one remotely operable valve between said fluid inlet and fluid outlet;

an inlet for pressurizing gas or liquid and an outlet for pressurizing gas or liquid at or adjacent said fluid inlet whereby a pressurizing gas can be provided in use at least into the container about said fluid conduit; and

a cleansing and/or sterilizing fluid pathway having a fluid inlet connectable to receive said cleansing and/or sterilizing fluid and a fluid outlet in communication with said fluid pathway, said communication occurring immediately downstream of said fluid pathways fluid inlet and said remotely operable valve;

said method comprising the steps of substantially closing or keeping closed said remotely operable valve;

causing a cleansing and/or sterilizing fluid to pass through said cleansing and/or sterilizing fluid inlet, said cleansing and/or sterilizing fluid exiting through said fluid outlet.

Preferably said cleansing fluid comprises concentrated liquid or solid alkaline detergent substantially dissolved or mixed with water.

Preferably said sterilizing fluid comprises concentrated liquid iodophors or hydrogen peroxide/peracetic acid solution or ozone substantially dissolved or mixed with water.

Preferably a remotely operable valve is provided in said gas pressurized liquid dispensing system such that said cleansing and/or sterilized fluid and/or gas may exit said gas pressurized liquid dispensing system.

Preferably said remotely operable valve has associated therewith a flow indicating means.

Preferably said flow indicating means and said remotely operable valve is connectable into a logic circuit whereby there is the prospect of operation in at least one or more of the following situations:

a first situation the liquid remaining in said liquid dispensing system can be substantially purged or drained from said system;

a second situation in which said cleansing and/or sterilizing fluid is caused to flow within said liquid dispensing system;

a third situation in which said cleansing and/or sterilizing fluid and/or water is purged or dispensed from said system through said remotely operable valve;

a fourth situation in which gas is purged from said system through said remotely operable valve (as in re-prime mode);

in the first and third situation said remotely operable valve is closed or allowed to close responsive to a signal from said flow indicating means of liquid flow indicative of said system being empty or almost empty of said fluid liquid to be purged or dispensed; and

in the fourth situation said remotely operable valve is closed or allowed to close responsive to signal from said flow indicating means liquid flow indicative of said system being full or almost full of said fluid liquid to be dispensed.

Preferably said gas pressurized liquid dispensing system is substantially as hereinbefore described.

In yet another aspect the present invention consists in a gas pressurized liquid dispensing system (or pumped system as defined);

said gas pressurized liquid dispensing system dispensing from at least two containers (whether comprising a single container, containers connected in series or multiple containers connected in parallel hereinafter "containers") and dispensing out multiple taps;

said multiple containers and said multiple dispensers being connected by means of an array of remotely operable valves such that at least two containers can be selectively dispensed from at least one tap or at least two taps can selectively dispense from at least one container.

Preferably said remotely operable valves are of the normally closed type.

Preferably said liquid dispensing system is substantially as hereinbefore described.

Preferably said remotely operable valves are controllable by a logic circuit.

Preferably said array of interconnections comprises an array of remotely operable valve-interrupted fluid pathway connections between fluid pathways individually connected to said containers and fluid pathways individually connected to said dispensing means.

Preferably the connection of any said container to said dispensing means or any said dispensing means to any said container that is undesirable is prevented by means of the blockage or non-connection of said fluid pathway associated with said dispensing means and said fluid pathway associated with said container.

In yet another aspect the present invention consists in a solenoid valve providing for the selectable occlusion of a fluid pathway between a fluid inlet and a fluid outlet:

said solenoid valve comprising a selectively operable magnet surrounding said fluid pathway;

a magnetically movable occluding member movable under the action of said selectively operable magnet to occlude said fluid pathway.

Preferably said occluding member comprises a ball.

Preferably said solenoid valve is of a pilot type operation, that is, as said solenoid valve is opened an initial pressure relieving amount of fluid is first allowed to flow before full flow occurs.

Preferably said selectively operable magnet comprises an electro magnet.

Preferably said fluid flow occurs through the centre of said selectively operable magnet.

Preferably said fluid flow occluding member is biased in a normally open or normally closed position by biasing means.

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Preferably said biasing means comprises a solid rubber or other similar spring.

Preferably said electromagnet comprises a coil wound directly on said fluid pathway, that is, not involving a bobbin.

The invention consists in the foregoing and also envisages constructions of which the following gives examples.

BRIEF DESCRIPTION OF THE DRAWINGS

The preferred form of the present invention will now be described with reference to the accompanying drawings in which;

Figure 1 is a diagrammatic view of one form of the present invention;

Figure 2 is a diagrammatic view of a form of the invention as illustrated in Figure 1 when decanting from a container;

Figure 3 is a diagrammatic view of one form of the invention when decanting from another container;

Figure 4 is a diagrammatic view of a form of the invention when in purge mode;

Figure 5 is a diagrammatic view of one form of the present invention when in cleaning or sterilizing mode;

Figure 6 is a diagrammatic view of one form of the present invention when in flush or pre-rinse mode;

Figure 7 is a diagrammatic view of one form of the present invention when in purge mode (after cleaning cycle);

Figure 8 is a diagrammatic view of a one form of the present invention when in re-prime mode;

Figure 9 is a partial sectional view of a container connector according to one form of the present invention;

Figure 10 is a partial sectional view of a container connector according to one form of the present invention;

Figure 11 is a partial exploded isometric view of an array of remotely operable valves according to another form of the present invention;

Figure 12 is a partial sectional view of a remotely operable valve of the form of the invention shown in Figure 11;

Figure 13 shows a partial sectional view of a container connector according to one form of the present invention;

Figure 14 is a partial sectional view of a container connector according to one form

of the present invention;

Figure 15 is a partial sectional view of an alternative remotely operable valve with the form of the invention as shown in Figure 11;

Figure 16 is a schematic diagram of the logic circuit (excluding cleaning logic) according to one form of the present invention;

Figure 17 is a schematic diagram showing connections between control system elements according to one form of the present invention;

Figure 18 is a schematic diagram showing connections between control system elements according to one form of the present invention;

Figure 19 is a partial sectional view of an alternative remotely operable valve associated with a container connector according to one form of the present invention; and

Figure 20 is a partial sectional view of an alternative remotely operable valve with the form of the invention as shown in Figure 11.

DETAILED DESCRIPTION

As shown in Figures 1 to 8 one form of the present invention comprises a system of connecting at least two containers from which liquid can be expressed under gas pressure to at least one fluid outlet or outlet tap. The invention preferably also provides for the purging, cleaning, flushing and re-priming of said system.

This system may be used, for example, in a bar where the at least two containers 4 and 14 are kegs and the fluid outlet or outlet tap 41 is a beer tap.

The form of the invention as illustrated is constructed from a series of interconnected pipes, hoses, fluid pathways or tubes which are at least in preferred forms of the invention when used to transport beer, cider or other similar beverages manufactured from a food grade plastics material. When used in one of its preferred forms to provide a supply of, for example, beer or cider to a bar, the system may be divided into two parts a section 3 which is accessible in the dispensing area of the bar and a section 4 which is substantially non-accessible from the dispensing area of the bar the two sections may be divided by a wall 2. The section 4 (or part thereof, except gas supply) may be, for example, contained within a cool store or a non-cooled storeroom in which case an under bar cooling system may be provided to cool the beer, cider or similar beverage before it is dispensed.

The temperatures of individual dispensing lines may be monitored by the control system with indicating means used to announce status.

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As shown in Figure 1 present in the dispensing system are a series of normally closed solenoid valves 5, 15, 44, 52, 59, 67 and 68. These valves are operated under the control of the logic circuit, for example as shown in Figure 16. Thus the logic circuit can convert the state of the said solenoid valve from closed to open thus allowing flow to occur. In forms of the invention the valves are transformed into the open state for only as long as a signal is present from the logic circuit. In other less preferred forms of the invention the valves remain open until such time as a signal to close the valves occurs. The solenoid valves 5, 15, 44, 52, 59, 67 and 68 are, when used in a system to dispense beer, cider or similar beverage are manufactured from a food grade or approved type of material. In forms of the invention these valves may consist of a in-line, direct acting or two stage pilot operated solenoid valve. The valve plunger or diaphragm is biased towards a closed position by means of, for example, a compression spring. The two stage pilot operated valve provides additional protection against the possibility of cleaning fluid contamination of keg supply by requiring substantially higher cleaning fluid pressures to open such valve in reverse flow, than would be the case with a direct acting valve. A form of this valve is shown in Figures 13, 14 and 19. Those skilled in the art to which the invention relates will realise that a variety of differing valves electrically operable may be utilised.

Also present in a preferred form of the system are flow indicating means or liquid/gas sensors 6, 16, 45 and 69. These are sensors are of a type that provides little or no impediment to the flow of liquids and gases past by or through them. The function of these liquid/gas sensors 6, 16, 45 and 69 is to provide a signal indicative of the presence of flow of a liquid past the said sensor. In a preferred form of the invention the said sensors provide a signal upon the fluid flowing past or through said sensor changing from substantially that of a liquid to substantially that of a gas or from substantially that of a gas to substantially that of a liquid.

In a preferred form of the invention this is achieved by means of a solid state optical liquid sensor which utilises the principle of total internal reflection by means of an integral LED and photo sensor so arranged so that when a liquid does not cover the sensor a light path is established between them. Thus the sensor is able to provide a signal indicative of the presence of a liquid and a differing signal upon the presence of a gas.

Those skilled in the art to which the invention relates will realise that a variety of

other suitable sensors may be utilised. Suitable sensors are able to provide a fast indication of the change in fluid flowing past or through said sensor from that substantially of a liquid to that substantially of a gas or from that substantially of a gas to that substantially of a liquid. In preferred forms of the invention the sensors are of a food grade or certifiable type, that is, they have substantially no adverse effect upon the liquid and/or gas flowing past said sensor.

Also present in a preferred form of the system is a microprocessor circuit 152 which gives the solenoid valve/sensor assembly "intelligence", allowing it to be part of a distributed control network. For example see Figure 18.

Also present at least a preferred form of the system are several one way valves 8, 9, 18, 19, 42, 65, 66, 70. These valves substantially allow the flow of fluid in one direction and substantially prevent the flow of fluid in the opposing direction. Those skilled in the art to which the invention relates will realise that a variety of valves may be utilised. In preferred forms of the invention the valves are suitable for use in a food or consumable liquid system eg. a food grade or certifiable type. One preferred form of the invention utilises the valves for liquid flow comprising a nylon (or similar) shuttle which is spring biased to substantially occlude a hole through which liquid may (when hole is not occluded) pass. The occlusion of said hole substantially prevents the flow of liquid unless the said shuttle is moved away from a position occluding the hole against the biasing means. The direction in which flow is substantially allowed by the said one way valves is denoted by arrows in the diagrammatic views 1 to 8. Valves for gas flow (8, 18) are preferably of the 'duckbill' type and are only required if the alternative arrangement of individual purge lines to each keg is utilised.

In a preferred form of the invention which utilises a standard connector for 50ℓ kegs there may be present a handle 150 which is used to initiate the connection of said connector to a standard keg fitting by causing valves present in the keg 14 (as they are in various known kegs) to be opened.

Also present in standard fittings is an additional one way valve (not shown) at location 151. This provides an added security in addition to the solenoid valve against the egress of cleaning and/or sterilization substance into the container 14.

In order to provide for the decanting of liquids from the containers 4 and 14 a source of gas 31 is provided. This source may be a container of compressed gas, a generator whether utilising chemical re agents or otherwise or a compressor. As is known

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in one form of the invention this source 31 comprises a source of compressed carbon dioxide. The use of carbon dioxide to decant liquid such as beer, cider, etc, is well known in the art to which the invention relates. Other suitable gases include nitrogen which can be used to provide for the decanting and a suitable amount of "head" for such beverages as stout. The source of gas 31 is in preferred forms of the invention provided with a manually operable shut off valve 32. In other forms of the invention this shut off valve may be a remotely operable solenoid valve and may optionally be located downstream of the junction of valve 59 and CO_2 source.

The supply pressure(s) for these gas(s) may be monitored by the control system with indicating means used to announce status.

In order to provide for the cleaning and/or sterilization of the said beverage dispensing system a source of cleansing substance 54 and/or optional sterilizing substance 64 is provided. Those skilled in the art to which the invention relates will be aware that a variety of suitable cleaning and/or sterilizing substances could be used. In preferred forms of the invention the flow of cleaning and/or sterilizing substance is controllable by the said control system and valves 67, 68. In a preferred form of the invention the cleaning and/or sterilizing substance is injected into a supply or flow of water by means of an injector/mixer 53. The water is supplied from a water source 51 and the supply of water is preferably controllable by said control system by means of a solenoid valve 52 and a pressure regulator (not shown). Those skilled in the art to which the invention relates will realise that a variety of suitable injectors 53 may be utilised.

In a preferred form of the invention a chemical concentration sensor, for example, a pH, for example, a conductivity sensor is present in the circuit to enable the flushing or purging or cleaning process to be terminated by the detection of the substantial absence of chemicals in the flushing fluid by, for example, monitoring the pH by, for example, monitoring the conductivity of the fluid. The various cycles can thus be terminated at the point when substantially or the sterilising and/or cleansing chemicals are flushed from the system. The chemical concentration sensor may also provide an indication that the sterilising and/or cleansing chemicals have run out and need replenishment.

In a preferred form of the invention flushing and cleaning fluids are used in a one-pass, non recycling sequence. Alternatively such flushing and cleaning fluids may be recirculated by means of a pump after mixing is complete under control of the control

system or logic circuit.

As an alternative to the use of chemicals, the cleaning and/or sterilizing means may be provided by an ozone source.

The use of an ozone generator and an injector 53 in order to inject ozone into a supply of water 51 can provide an alternative food grade cleansing and/or sterilizing system but is less preferred.

It can be seen from the Figures that in at least a preferred form of the invention two purge modes are provided, a first purge mode which occurs before the cleaning mode and is shown in Figure 4 and a second purge mode which occurs after the cleaning mode and substantially removes the cleaning substance and/or water from the system. The first purge mode, as shown in Figure 4, substantially purges the dispensable liquid, eg. beer, cider, stout etc, from the pipes before cleaning occurs. As no cleansing and/or sterilizing substance is present in the system at this stage and the substance used to purge the system is preferably 31, for example, carbon dioxide or other substance which substantially does not affect the drinkability of said dispensable liquid, the liquid purged from the system can be dispensed from the tap or dispenser 41 and, if desired, consumed in the normal manner. In other forms of the invention the liquid may be simply directed through the operable valve 44 and into the drain 46.

The (optional) second purge mode, as shown in Figure 7, purges the system of flushing water and/or cleansing substance again by using the source 31, for example, carbon dioxide. In this mode the cleansing substance is preferably drained through the remotely operable valve 44 into the drain. However, for at least part of the cycling of the mode the dispenser 41 may be opened and thus purge the dispenser itself of the cleansing and/or sterilizing substance and/or flushing water. When in the second purge mode, sensor 45 is used to detect the change from liquid to gas. Thus when sensor 45 detects that a change has occurred from substantially liquid to substantially gas the logic circuit may terminate the purge mode thus ensuring that substantially little gas is wasted. It will be seen by those skilled in the art to which the invention relates that by the addition of valves or similar, for example, using the array of remotely operable valves hereinbefore described the lines leading to the container 4 and 14 and any other that may be present may be either separately or in groups purged, cleaned, flushed, purged again, if desired, and re-primed.

In particular, the addition of valves enables the re-prime mode, as shown in Figure

8, to individually re-prime the lines meeting to and from the containers 4 and 14 and therefore if additional full containers are added either at 4 or 14 or at any additional locations which may be easily provided, the individual keg may be automatically re-primed, thus, ensuring a substantially constant supply of liquid to be dispensed.

When in the re-prime mode the sensor 45 is used to detect the change from gas which is present due to the re-prime mode being immediately preceded by purge mode, as shown in Figure 6, to liquid to be dispensed. Thus when sensor 45 detects that a change has occurred from substantially gas to substantially liquid the logic circuit may terminate the re-prime mode thus ensuring that substantially little dispensable liquid is drained or wasted. Re-prime mode occurs with remotely operable valve 44 in its open state.

In the preferred arrangement, connection to valve 42 is located as far 'downstream' as possible, and preferably as close as possible to dispenser tap 41.

Any or all of the modes making up the cleaning cycle, (ie. purge, clean, flush, re-prime), may be programmed to be carried out in the sequence of one or more individual lines from the kegs 4 and 14 to the outlet taps 41, and any, all or additional modes may be programmed to achieved desired cleaning and/or sterilizing performance. The cleaning cycle may include wait states to ensure correct contact time.

As can be seen from the Figures the dispense section 3 of the beverage dispensing system 1, in preferred forms of the invention, contains a dispenser or tap 41. This dispenser may be of any suitable type known in the art to which the invention relates. In preferred forms of the invention this dispenser tap 41 comprises a manually openable, manually closable tap. Other forms of the invention are envisaged in which the dispenser or tap 41 may be controlled to some degree remotely such as by an electrically operable solenoid valve which would allow substantially automatic cleaning of such dispensers.

It is obvious to those skilled in the art to which the invention relates that the preferred form of the invention can be expanded to utilise a greater number of containers, ie. more than two.

This may be achieved by, for example, extending the hoses at 60 (optional), 61 and 62. The various valves and sensors, for example, 10 are provided for each additional container. A variety of dispensers 41 may also be provided which will require extending the hoses at 63.

The ease of cleaning a system such as described in which no manual effort is

required such as to disconnect kegs and/or set bar dispensers will help to ensure that cleaning operations are carried out regularly.

The system ensures all fluid pathways except actual keg inlet tap and bar dispensing tap are therefore clean.

It is envisaged that it will be necessary to clean the above said taps on a less frequent basis as follows:

1. Either during the standard clean cycle (or under the control of a special cleaning cycle) the bar dispensing taps are manually (or if solenoid operated, electrically) held open for at least part of the full duration of the clean cycle and drained into containers or into pathways connecting bar dispensing taps to a drain.
2. Keg taps are removed and are collectively or individually washed or back-flushed through with cleaning substance under manual control, or as part of a special cleaning cycle.

The array of remotely operable valves 40 as shown in Figures 11 and 12 provides fluid communication means between fluid pathways 41, 42, 43 and 44 and fluid pathways 51, 52 and 53. In the form of the invention as shown in the Figures, the array is produced from two substantially planar blocks 62 and 63, for example, nylon blocks. Contained within these blocks are a series of substantially parallel channels 71, 72, 73 and in 81, 82, 83 and 84. The fluid channels are interconnected through apertures or similar, for example, 91, 92, 93 and 94. Between the said pairs of aperture, for example, 91 and 92, there is present a remotely operable valve means 100. The valve means, as shown in the example given in Figure 12, 15 and 20 provides fluid communication between the fluid pathways, for example, 71 and 41. In forms of the invention the valve is of a normally closed type and biased with a spring 102 or 302, and may consist of a in-line, direct acting solenoid valve with or without integral microprocessor circuits allowing said solenoid valves to be part of a distributed control network. However, other forms of remotely operable valve means are envisaged. The blocks of material 62 and 63 are preferably joined by a spacer element 101.

In an alternative preferred form of the invention as illustrated in Figure 20 the valve 100 is in the form of a ball valve. The ball 302 in its normal position occludes an opening 71. In the preferred form of the invention the ball is biased in to place by a biasing means 300. In the preferred form of the valve there are two or more fluid pathways 310

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and 311 providing for flow of the fluid when the valve is in its open condition.

It can be seen that the array of remotely operable valves may provide selective fluid communication, for example, between containers from which liquid is to be dispensed under gas pressure connected to the fluid inlets 41, 42, 43 and 44 and a variety of fluid dispensing, for example, taps connected to the fluid outlets 51, 52 and 53. Therefore, upon the selective opening of the various remotely operable valves 100 the container connected to a particular tap or dispenser can be selected and/or a particular dispenser dispensing from a particular container can be selected. This may be under the control of a logic circuit and may be included in a liquid dispensing under pressure system as hereinbefore described.

Should any of the matrix of interconnections be undesirable, for example, in a beer dispensing system the dispensing of a stout from a bitter beer tap the interconnection between the fluid pathway connecting that container to a dispenser may be simply blocked by a plug or similar.

Figure 19 illustrates an alternative remotely operable valve associated with a container connector. According to another form of the present invention this form of the valve is of the type having a ball 302 biased by biasing means 302. The ball has associated therewith a diaphragm 306. The diaphragm 306 has an aperture therethrough 307. When in the closed position the portion of the diaphragm 306 not having apertures 307 therethrough occludes an opening thus preventing fluid flow. When the valve moves towards the open condition, fluid is able to flow through the apertures 307 and through the fluid passageways 211 and 212.

The valves illustrated in Figure 20 includes a biasing device 300. The biasing device is preferably of a solid as opposed to an open spring thereby reducing the effective area acted on by upstream pressure. For example, the biasing device 300 may comprise a sealed, silicon rubber, bellows type device with or without a spring or a closed cell silicon rubber or similar foam "spring". The reduction in effective area acted on by upstream pressure allows a reduction in the energy required to open and close the valve. For example, it allows a lower wattage coil to be used to open the valve against the pressure and/or extends the operating pressure range of the valve. The valve is preferably constructed from a mild steel outer case 301, a plastics material, for example, food grade or other nylon 303 and a ferritic stainless steel or plated mild steel inner portion 304. The sealing ball 302 is preferably a ferritic stainless steel or plated mild steel. The coil

of the valve is preferably wound directly onto the assembly 305. In preferred forms of the invention no bobbin is used.

The valve illustrated in Figure 19 is pilot operated. It uses a diaphragm 306 acted on by the ball 302. The diaphragm has holes 307 therethrough thereby allowing a small release of pressure before the valve opens completely. The valve as illustrated in Figure 14 utilises a similar principle in that it includes a diaphragm 306 with a hole therethrough 307.

It will be obvious to those skilled in the art to which the invention relates that additional containers (whether a single container or containers connected in series or parallel may be easily added by, for example, extending the fluid pathways at 61 and 62. The use of the hereinbefore described array of remotely operable valves in conjunction with these additional containers and/or additional dispensing means will produce a system which has flexibility as to which container is dispensed from which tap and also enables the supply of liquid to be substantially uninterrupted as containers run out and new full ones are automatically, under the influence of the logic circuit, connected into the system.

In the preferred arrangement, Figure 1, the relative positions of sensors 6, 16, 45 may optionally be interchanged with their associated remotely operable valves 5, 15, 44.

It will be obvious to those skilled in the art to which the invention relates that the provision of means to switch between containers as the containers become empty and/or to substantially automatically clean and/or sterilise a liquid delivery system, can be applied to a wide range of beverage dispensing systems, whether gas pressure driven or pumped. Included in such applications are flavoured carbonated beverage dispensing systems, typically referred to as "post mix" systems, which often utilise containers of the "Bag-in-Box" form.

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CLAIMS:

1. In and/or for a gas pressurized liquid delivery system, (as hereinbefore defined) the use of

(I) an assembly connectable to a container from which liquid is to be expressed under gas pressure, **said assembly** being connectable into, to and/or about an opening of a said container and defining,

a fluid pathway having a fluid inlet connectable to receive a liquid being gas pressure moved up a conduit from adjacent the bottom of the container (if said assembly is not located adjacent the bottom of the container) from said container and a fluid outlet connected in use to or forming a fluid conduit,

at least one remotely operable valve between said fluid inlet and the fluid outlet or fluid conduit outlet,

an inlet for a pressurizing gas and an outlet for the pressurizing gas or liquid at or adjacent said fluid inlet whereby a pressurizing gas can be provided in use at least into the container about said fluid conduit, and

flow indicating means within said fluid pathway (preferably between said remotely operable valve and said fluid inlet, and

(II) a logic circuit (hard wired and/or computer or PLC or computer AND/OR serial or parallel microprocessor(s) controlled where microprocessor(s) are part of a centralised or distributed control network, and if microprocessor(s) are part of a distributed control network, microprocessor circuits are integral with said assembly and include means to sense and/or indicate said flow indicating means and control said remotely operable valve and optionally to sense and/or control and/or indicate liquid flow rate and/or liquid or room temperature and/or gas pressure in container or said fluid pathway) whereby

in a first situation where said remotely operable valve has been opened and fluid is passing through said fluid pathway from the container associated with the assembly, said remotely operable valve is closed or allowed to close responsive to a signal from said flow indicating means (with or without additional logic input from or reference to a computer, microprocessor, PLC or other sensing means either remote or integral with assembly which may override such signal) of a fluid flow indicative of the container being empty or almost empty, and

in a second condition, where said remotely operable valve is closed but is in

communication with a container to which the assembly is connected, and is opened or allowed to open (at least where there is a demand for the fluid of the system and subject to any additional logic requirement as aforementioned) and a like assembly has just halted fluid flow from another container under action from the logic circuit (as in the first condition aforesaid).

2. An assembly as claimed in claim 1 which includes a second valve preferably interposed between said remotely operable valve and said fluid inlet and said gas inlet such that any pressurizing gas and container liquid can be shut off beyond said valve but both may be capable of being dispensed under the control of said remotely operable valve once said second valve is opened.

3. An assembly as claimed in claim 1 or 2 wherein said flow indicating means within said fluid path way is as close as possible to said fluid inlet.

4. An assembly as claimed in claim 1 wherein said remotely operable valve is biased (eg. by spring or other means) to a closed condition when not being energized.

5. An assembly as claimed in claim 1 wherein said remotely operable valve is a pilot operated two stage in-line electrically operated solenoid valve or other form of electrically operated valve.

6. An assembly as claimed in claim 1 wherein said flow indicating means are of an optical liquid sensor.

7. An assembly as claimed in claim 1 wherein said flow indicating means comprises a solid state liquid level switch which utilises the principle of total internal reflection.

8. An assembly as claimed in claim 1 wherein said flow indicating means comprises a solid state liquid level switch RS 317-819 available from RS Components, 12 Saunders Place, Auckland, New Zealand.

9. An assembly as claimed in claim 1 wherein said logic circuit comprises a programmed computer or PLC or a combined computer and/or separate serial or parallel microprocessor(s) where microprocessors are part of a centralised or distributed control network.

10. An assembly as claimed in claims 1 wherein said distributed control network consists (in part) of separate microprocessor circuits attached to each remotely operable valve/flow indicating means assembly.

11. An assembly as claimed in claim 9 or 10 wherein said programmed computer or microprocessor also includes a form of usage monitoring, recording and control and,

optionally a system of automatic re-ordering, liquid flow, temperature, gas pressure or pH monitoring and/or recording.

12. An assembly as claimed in claim 9 or 10 wherein said computer program allows the said containers to be dispensed from in the order they are connected into the system alternatively said computer program allows said containers to be dispensed from in the order of manufacturing, ie. brewing.

13. An assembly as claimed in claim 12 wherein the date of manufacturing being preferably read in from a bar code on said container.

14. An assembly as claimed in claim 1 wherein said system also includes means to inject into said fluid pathways and/or assembly cleaning and/or optional sterilization means.

15. An assembly as claimed in claim 14 wherein said cleaning means comprises a concentrated liquid or solid alkaline detergent substantially dissolved or mixed with water.

16. An assembly as claimed in claim 14 or 15 wherein said optional sterilization means comprises concentrated liquid iodophors or hydrogen peroxide/peracetic acid solution or ozone substantially dissolved or mixed with water.

17. An assembly as claimed in claim 14 or 15 wherein said concentrated cleaning and optional sterilizing means are injected and mixed into a flowing water stream by means of an injector/mixer without requirement for external pumping of the cleaning and/or sterilizing substances.

18. An assembly as claimed in claim 14 or 15 wherein said concentrated cleaning and optional sterilizing means are injected and mixed into a flowing water stream by means of a positive-displacement chemical feed pump(s).

19. An assembly as claimed in claim 1 wherein said system includes means to purge said fluid pathway and/or assembly of fluid by means of a dispensing gas (or water) independent of the pressurizing gas into the container.

20. An assembly as claimed in claim 14 wherein said system includes means to pre-rinse said fluid pathway and/or assembly with water prior to injecting cleaning means if purge is carried out with gas rather than water.

21. An assembly as claimed in claim 19 or 20 wherein said independent dispensing gas is injected by means of pathways used to inject said sterilization and/or cleaning means.

22. An assembly as claimed in claim 19 wherein said independent dispensing gas is injected by means of pathways independent of pathways used to inject said sterilization and/or cleaning means.

23. An assembly as claimed in claim 14 wherein said system includes means to flush from said fluid pathways and/or said assemblies the cleaning and/or sterilization means and includes means to terminate the flushing process by "detecting" the absence of chemicals in the flushing liquid by monitoring pH.

24. An assembly as claimed in claim 1 wherein said assembly includes one way valve(s) to restrict the flow of container liquid but substantially not restrict the flow of said independent dispensing gas and/or said cleaning and/or sterilization fluid.

25. An assembly as claimed in claim 1 wherein said assembly includes one way valve(s) to restrict the flow of said independent dispensing gas and/or said cleaning and/or sterilization fluid into the container.

26. An assembly as claimed in claim 1 wherein said system includes means to re-prime said fluid pathways with fluid.

27. An assembly as claimed in claim 23 wherein said means to purge, flush, prime and clean fluid pathways are controlled (with the ability to purge, flush, prime and clean individual or combinations of multiple lines as programmed), sequenced and recorded by the said computer programme or PLC or computer and serial or parallel microprocessor(s), in a centralised or distributed control network.

28. An assembly as claimed in claim 23 wherein said means to purge, clean, flush and prime can be substantially carried out without disconnection of said assembly(s) from container(s).

29. An assembly as claimed in claims 23 wherein cleaning and flushing fluids are distributed by means of mains water pressure or where mains water pressure is insufficient by means of a pump.

30. An assembly as claimed in claim 23 wherein the cleaning and flushing means are used in a one-pass, non recycling sequence with or without wait states.

31. An assembly as claimed in claims 23 wherein the cleaning and flushing means are recirculated, (continuously or with wait states) by means of a pump, after mixing of cleaning and optional sterilizing means is complete.

32. An assembly as claimed in claim 23 wherein the control system provides means to automatically terminate the purge and re-prime cycles.

33. A liquid dispensing system having

an outlet tap operable at a liquid dispensing station (eg. a bar) to dispense liquid,

at least two kegs or other containers (hereafter "kegs" - the term keg being as

hereafter defined),

conduiting means from said kegs to said outlet tap,

a remotely operable valve in said conduiting means preferably at or adjacent each said keg,

gas pressurizing or pumping means (as defined) to pressurize the contents of each keg to allow the expressing of liquid therefrom into said conduiting means if allowed by said remotely operable valve and from there, if allowed, out of said outlet tap,

a liquid flow detector in said conduiting means at or adjacent each said keg, and

logic means (hard wired and/or computer or PLC or computer AND/OR serial or parallel microprocessor(s) controlled where microprocessor(s) are part of a centralised or distributed control network and if microprocessor(s) are part of a distributed control network, microprocessor circuits are integral with said assembly and include means to sense and/or indicate said flow indicating means and control said remotely operable valve and optionally to sense and/or control and/or indicate and/or liquid flow rate and/or liquid or room temperature and/or gas pressure in keg or said fluid pathway) whereby in operation at least one of said remotely operable valves opens a passageway for liquid to move under gas pressure from a liquid containing keg under the control of said outlet tap, and whereby said remotely operable valve is closed or allowed to closed by said logic means responsive to an indication of a liquid flow from said keg indicative of the keg being empty and/or soon to be empty (and in satisfaction of any other logic requirements from or by reference to a computer or microprocessor or sensor either remote or integral with assembly which may override such indication), said logic means or substantially simultaneously therewith opening or allowing the opening of an remotely operable valve of another keg (subject to any other logic requirement as aforementioned) such that there is a minimum of gas inflow into said conduiting means between each said remotely operable valve and said outlet tap.

34. A liquid dispensing system as claimed in claim 33 wherein said conduiting means is connected into the top of each said keg or to the bottom of a tank (such tank having no internal fluid pathway to move liquid from adjacent the bottom of the tank to the opening of the tank).

35. A liquid dispensing system as claimed in claim 33 or 34 wherein each said keg is provided with an internal conduit from adjacent the bottom thereof (if said connection is not located adjacent the bottom of the keg) to the connection with said conduiting

means, said connection allowing gas inflow into the keg about such internal keg conduiting and the upflow of liquid from such a keg responsive to said gas pressure when such flow is permitted by a said outlet tap and/or the associated remotely operable valve.

36. A liquid dispensing system as claimed in claim 33 wherein an additional valve is provided at or adjacent each such keg such that said conduiting means can be closed independent of said remotely operable valve, eg. as might assist during the adding of fresh kegs or the removal of empty kegs from the battery of kegs.

37. A liquid dispensing system as claimed in claim 33 wherein said conduiting means is preferably a common conduiting means for each keg to be connected in sequence, etc as permitted by the logic means to a particular outlet tap or taps.

38. A liquid dispensing system as claimed in claim 33 wherein said conduiting means includes a valved connection to a washing fluid circuit and said connection to said washing connection circuit is permitted by said logic means only when each said remotely operable valve is closed (if valve located adjacent each keg).

39. Apparatus capable of producing a system as described above.

40. An assembly connectable to a container from which liquid is to be expressed under gas pressure (or pumped as defined), said assembly being connectable into, to or about an opening of said container and defining

a fluid pathway having a fluid inlet connectable to receive a liquid being gas pressure moved (or pumped as defined) up a conduit from adjacent the bottom of the container (if said assembly is not located adjacent the bottom of the container) from said container and a fluid outlet connectable in use to a fluid conduit;

at least one remotely operable valve between said fluid inlet and fluid outlet or fluid conduit outlet;

an inlet for a pressurizing gas and an outlet for the pressurizing gas or liquid at or adjacent said fluid inlet whereby a pressurizing gas can be provided in use at least into the container about said fluid conduit, and

flow indicating means within said fluid pathway.

41. An assembly as claimed in claim 40 wherein said flow indicating means is located between said remotely operable valve and said fluid outlet or inlet and preferably as close as possible to said fluid inlet.

42. An assembly as claimed in claim 40 or 41 wherein said flow indicating means comprises a optical liquid sensor.

43. An assembly as claimed in claim 40 or 41 wherein said optical liquid level sensor utilises the principle of total internal reflection.

44. An assembly as claimed in claim 42 or 43 wherein said liquid level sensor comprises a solid state liquid level switch RS 317-819 available from RS Components Limited, 12 Saunders Place, Auckland, New Zealand.

45. An assembly as claimed in claim 40 wherein an inlet for a sterilizing or cleansing liquid and/or gas and an outlet for said sterilizing or cleansing liquid and/or gas whereby a cleansing or sterilizing liquid and/or gas may be routed through at least part of said fluid pathway.

46. An assembly as claimed in claim 40 wherein a one way valve is provided between said inlet for sterilizing or cleansing liquid and/or gas and said outlet for gas or liquid.

47. An assembly as claimed in claim 40 wherein a one way valve is provided between said inlet for pressurizing gas and said outlet for gas or liquid.

48. An assembly as claimed in claim 40 wherein said assembly is connectable into a logic circuit whereby in a first situation where said remotely operable valve has been opened and liquid is passing through said fluid pathway from a container associated with the assembly, said remotely operable valve is closed or allowed to close responsive to a signal from said flow indicating means (with or without additional logic input from or by reference to a computer, microprocessor or sensor either remote or integral with assembly which may override such signal) of liquid flow indicative of the container being empty or almost empty.

49. An assembly as claimed in claim 40 wherein a microprocessor circuit is provided allowing the assembly to be part of a distributed control network.

50. A method of cleansing and/or sterilizing a liquid dispensing system, said liquid dispensing system dispensing from at least one container, said container being connected into said liquid dispensing system by means of a connector, said connector having:

a fluid pathway having a fluid inlet connectable to receive a liquid being gas pressure moved (or pumped as defined) up a conduit from adjacent the bottom of said container (if said connector is not located adjacent the bottom of the container) and a fluid outlet connectable in use to a fluid conduit;

at least one remotely operable valve between said fluid inlet and fluid outlet;

an inlet for pressurizing gas or liquid and an outlet for pressurizing gas or liquid at or adjacent said fluid inlet whereby a pressurizing gas can be provided in use at least into

the container about said fluid conduit; and

a cleansing and/or sterilizing fluid pathway having a fluid inlet connectable to receive said cleansing and/or sterilizing fluid and a fluid outlet in communication with said fluid pathway, said communication occurring immediately downstream of said fluid pathways fluid inlet and said remotely operable valve;

said method comprising the steps of substantially closing or keeping closed said remotely operable valve;

causing a cleansing and/or sterilizing fluid to pass through said cleansing and/or sterilizing fluid inlet, said cleansing and/or sterilizing fluid exiting through said fluid outlet.

51. A method of cleansing as claimed in claim 50 wherein cleansing and/or sterilizing can be substantially carried out without disconnection of said connector from said container.

52. A method of cleansing as claimed in claim 50 or 51 wherein said cleansing and/or sterilizing fluid are used in a one-pass, non recycling sequence with or without wait states.

53. A method of cleansing as claimed in claim 50 wherein said cleansing fluid comprises concentrated liquid or solid alkaline detergent substantially dissolved or mixed with water.

54. A method of cleansing as claimed in claim 50 wherein said sterilizing fluid comprises concentrated liquid iodophors or hydrogen peroxide/peracetic acid solution or ozone or ozone substantially dissolved or mixed with water.

55. A method of cleansing as claimed in claim 50 wherein a remotely operable valve is provided in said gas pressurized liquid dispensing system such that said cleansing and/or sterilized fluid and/or gas may exit said gas pressurized liquid dispensing system.

56. A method of cleansing as claimed in claim 55 wherein said remotely operable valve has associated therewith a flow indicating means.

57. A method of cleansing as claimed in claim 56 wherein said flow indicating means and said remotely operable valve is connectable into a logic circuit whereby there is the prospect of operation in at least one or more of the following situations;

a first situation the liquid remaining in said liquid dispensing system can be substantially purged or drained from said system;

a second situation in which said cleansing and/or sterilizing fluid is caused to flow within said liquid dispensing system;

a third situation in which said cleansing and/or sterilizing fluid and/or water is purged or dispensed from said system through said remotely operable valve;

a fourth situation in which gas is purged from said system through said remotely operable valve (as in re-prime mode);

in the first and third situation said remotely operable valve is closed or allowed to close responsive to a signal from said flow indicating means of liquid flow indicative of said system being empty or almost empty of said fluid liquid to be purged or dispensed, and

in the fourth situation said remotely operable valve is closed or allowed to close responsive to signal from said flow indicating means liquid flow indicative of said system being full or almost full of said fluid liquid to be dispensed.

58. A method of cleansing as claimed in claim 50 wherein cleansing and/or sterilizing fluid are distributed by means of mains water pressure or where mains water pressure is insufficient by means of a pump.

59. A method of cleansing as claimed in claim 50 wherein cleansing and/or sterilizing fluid are injected and mixed into a flowing water stream by means of an injector/mixer without requirement for external pumping.

60. A method of cleansing as claimed in any one of claims 50 to 59 wherein said gas pressurized liquid dispensing system is substantially as hereinbefore described.

61. A gas pressurized liquid dispensing system (or pumped system as defined);

said gas pressurized liquid dispensing system dispensing from at least two containers (whether comprising a single container, containers connected in series or multiple containers connected in parallel hereinafter "containers") and dispensing out multiple taps or dispensers;

said multiple containers and said multiple taps or dispensers being connected by means of an array of remotely operable valves such that at least two containers can be selectively dispensed from at least one tap or dispenser or at least two taps or dispensers can selectively dispense from at least one container.

62. A gas pressurized liquid dispensing system as claimed in claim 61 wherein said remotely operable valves are of the normally closed type.

63. A gas pressurized liquid dispensing system as in claim in claim 61 or 62 wherein said remotely operable valves are in-line, direct acting or pilot operated solenoid valves or other form of electrically operated valves.

64. A gas pressurized liquid dispensing system as claimed in claim 61 wherein said solenoid valves contain individual integral or grouped remote microprocessor circuits

allowing said solenoid valves to be part of a distributed control network.

65. A gas pressurized liquid dispensing system as claimed in claim 61 wherein said liquid dispensing system is substantially as hereinbefore described.

66. A gas pressurized liquid dispensing system as claimed in claim 61 wherein said remotely operable valves are controllable by a logic circuit.

67. A gas pressurized liquid dispensing system as claimed in claim 61 wherein said array of interconnections comprises an array of remotely operable valve-interrupted fluid pathway connections between fluid pathways individually connected to said containers and fluid pathways individually connected to said dispensing means.

68. A gas pressurized liquid dispensing system as claimed in claim 61 wherein the connection of any said container to said dispensing means or any said dispensing means to any said container that is undesirable is prevented by means of the blockage or non-connection of said fluid pathway associated with said dispensing means and said fluid pathway associated with said container.

69. A solenoid valve providing for the selectable occlusion of a fluid pathway between a fluid inlet and a fluid outlet:

said solenoid valve comprising a selectively operable magnet surrounding said fluid pathway;

a magnetically movable occluding member movable under the action of said selectively operable magnet to occlude said fluid pathway.

70. A solenoid valve as claimed in claim 69 wherein said occluding member comprises a ball.

71. A solenoid valve as claimed in claim 69 or 70 wherein said solenoid valve is of a pilot type operation, that is, as said solenoid valve is opened an initial pressure relieving amount of fluid is first allowed to flow before full flow occurs.

72. A solenoid valve as claimed in claim 69 to 71 wherein said selectively operable magnet comprises an electro magnet.

73. A solenoid valve as claimed in any one of claims 69 to 72 wherein said fluid flow occurs through the centre of said selectively operable magnet.

74. A solenoid valve as claimed in any one of claims 69 to 73 wherein said fluid flow occluding member is biased in a normally open or normally closed position by biasing means.

75. A solenoid valve as claimed in claim 74 wherein said biasing means comprises a

solid rubber or other similar spring.

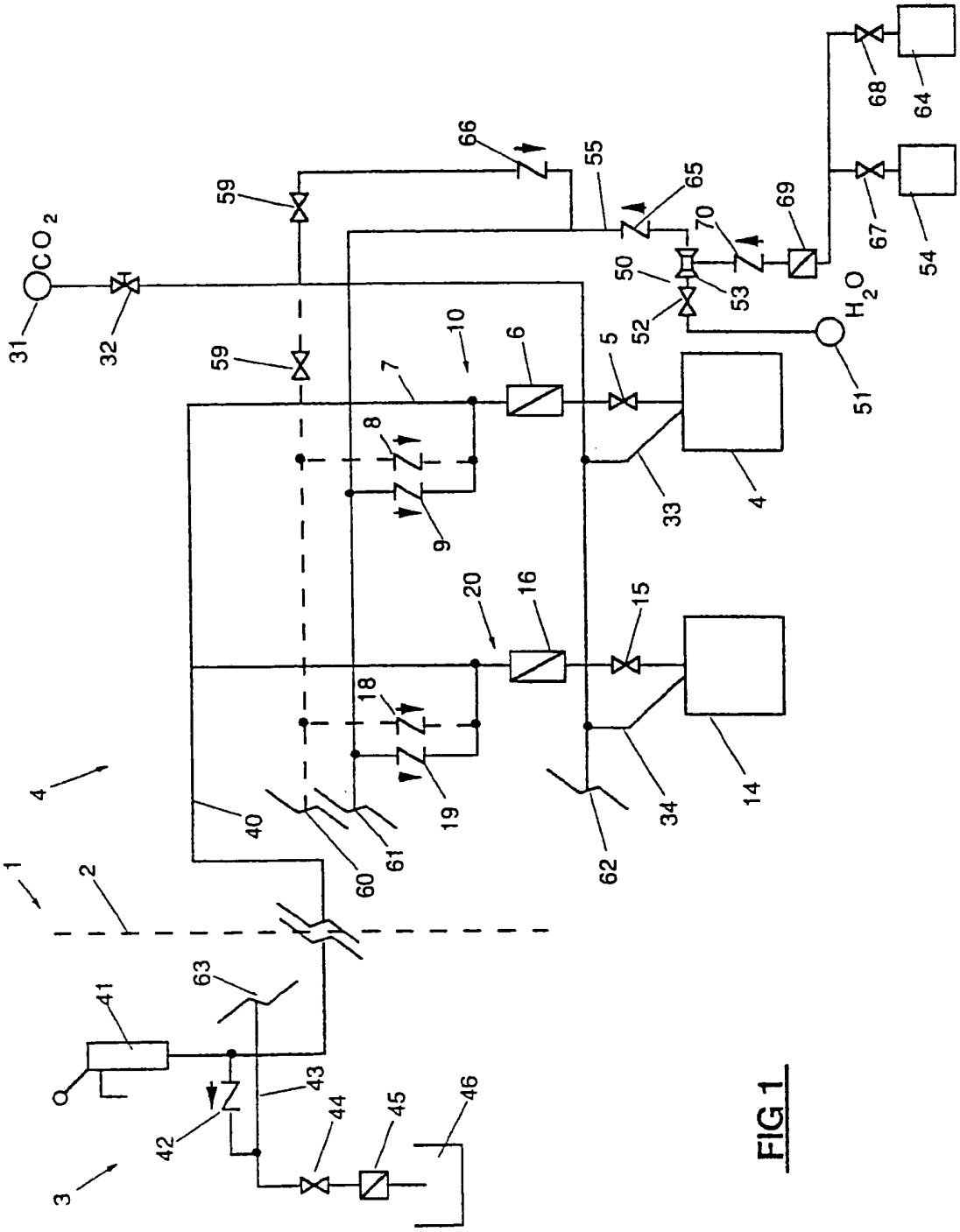
76. A solenoid valve as claimed in any one of claims 69 to 75 wherein said electromagnet comprises a coil wound directly on said fluid pathway, that is, not involving a bobbin.

77. A gas pressurized liquid delivery system as hereinbefore described with reference to one or more of the accompanying drawings.

78. A liquid dispensing system as hereinbefore described with reference to one or more of the accompanying drawings.

79. An assembly connectable to a container from which liquid is to be expressed under gas pressure as hereinbefore described with reference to one or more of the accompanying drawings.

80. A method of cleansing a liquid delivery system as hereinbefore described with reference to one or more of the accompanying drawings.


CO_2
H_2O
1
2
3
4
5
6
7
8
9
10
14
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31
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FIG 1

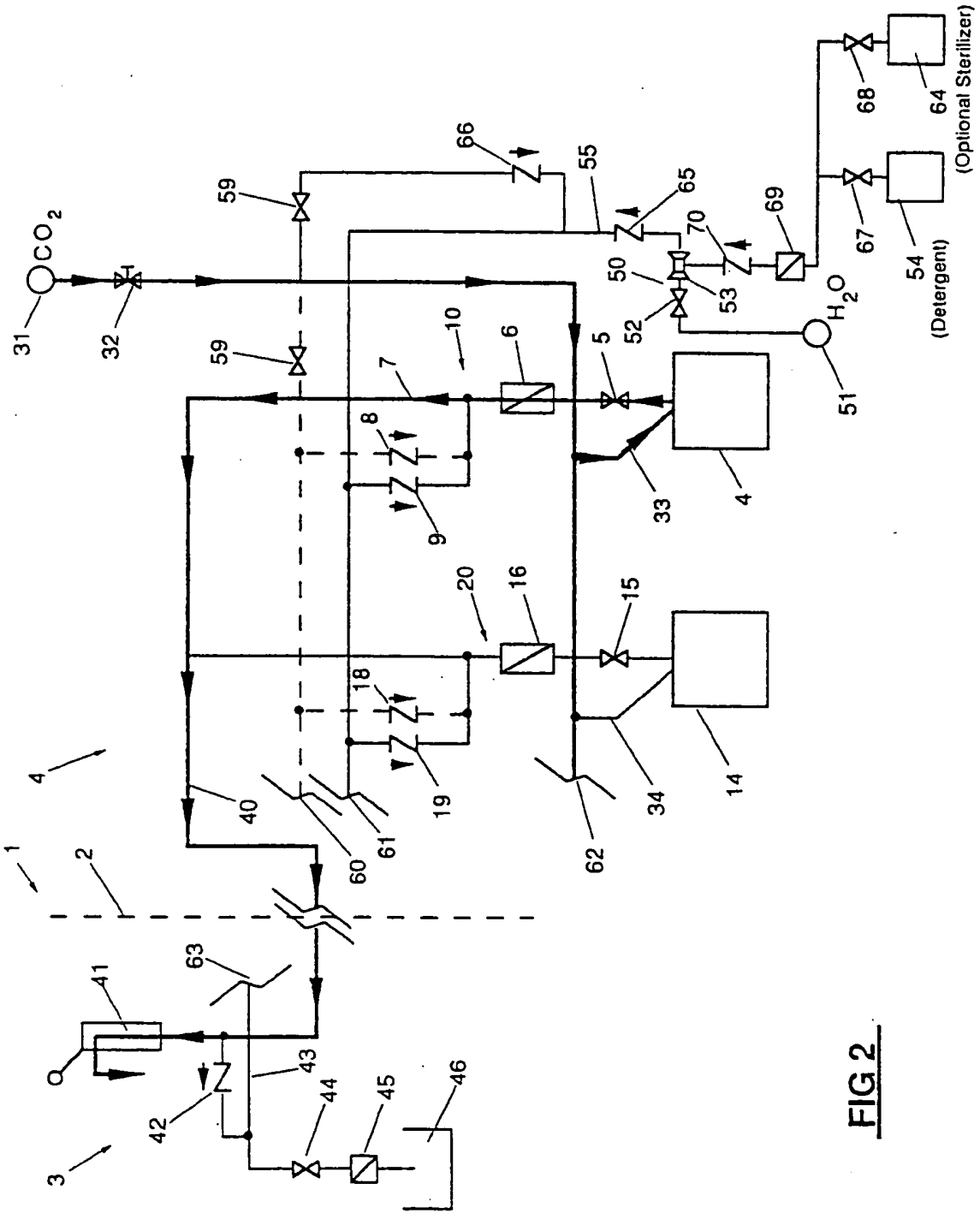
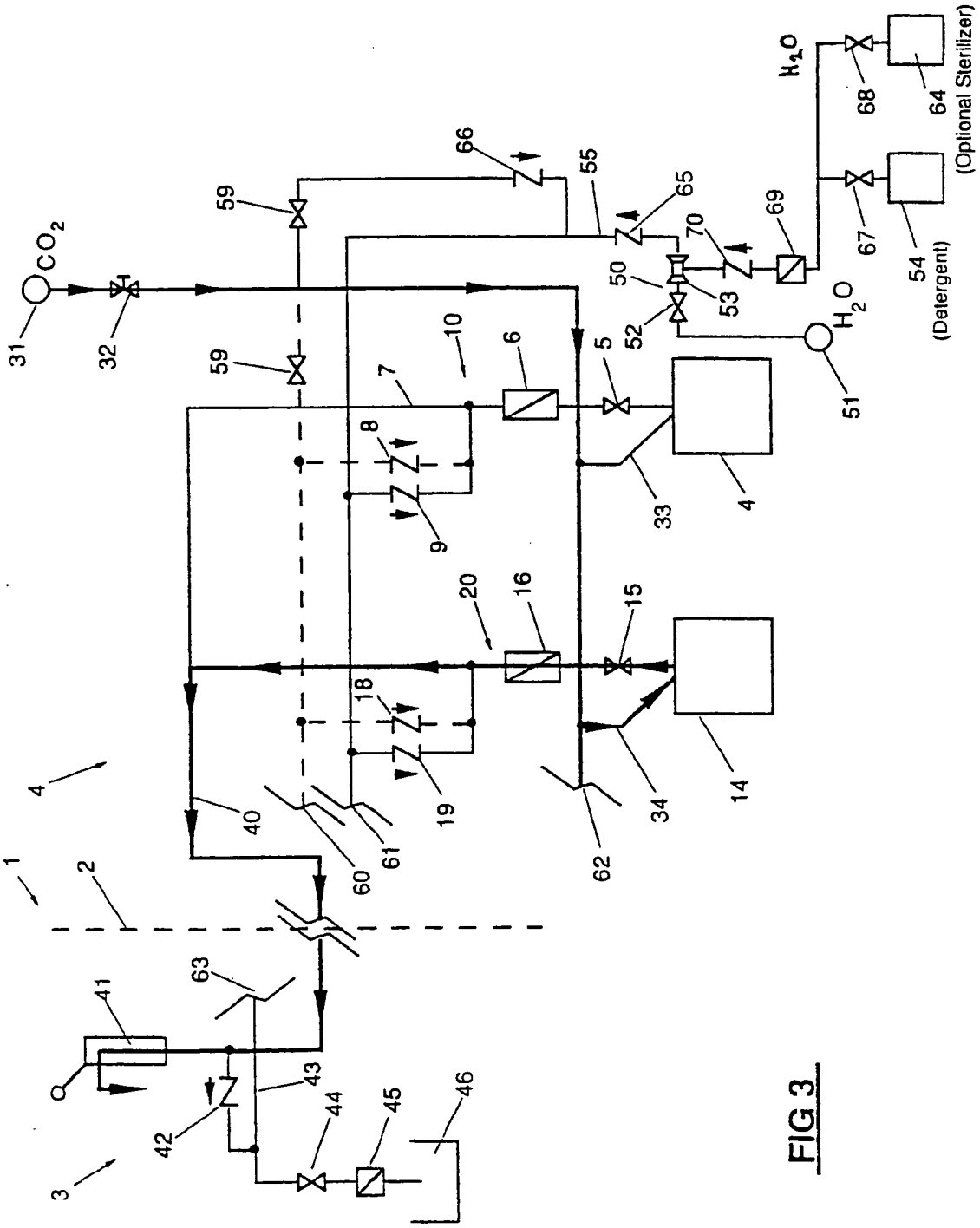


FIG 2

BNSDOCID: <WO_____9512543A1_I_>


CO_2
31
32
59
59
66
55
65
70
69
H_2O
68
64
(Optional Sterilizer)
67
54
(Detergent)
50
53
52
H_2O
51
10
6
5
7
8
9
33
4
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16
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3

FIG 3

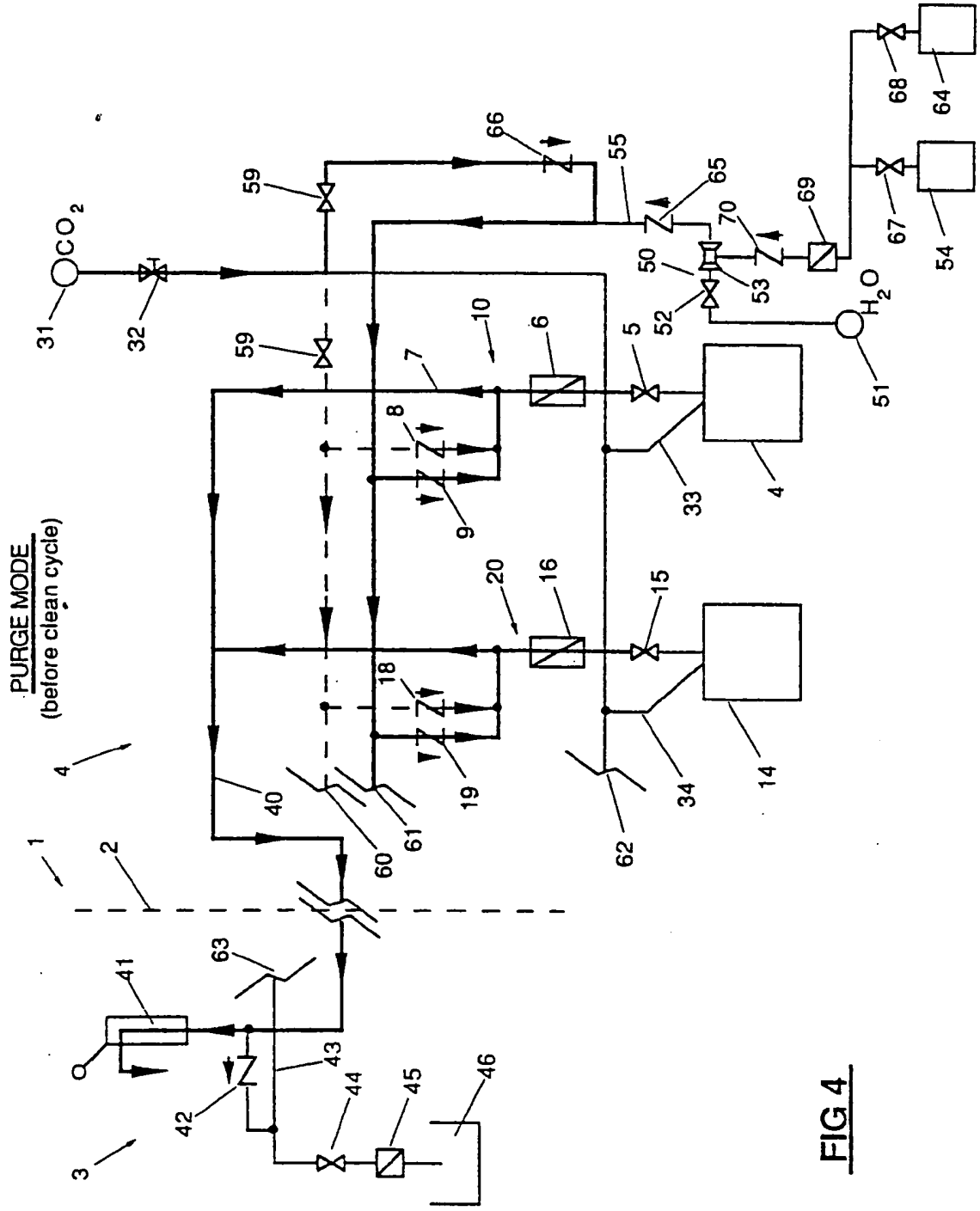
PURGE MODE
(before clean cycle)
CO_2
H_2O
O
1
2
3
4
5
6
7
8
9
10
14
15
16
18
19
20
31
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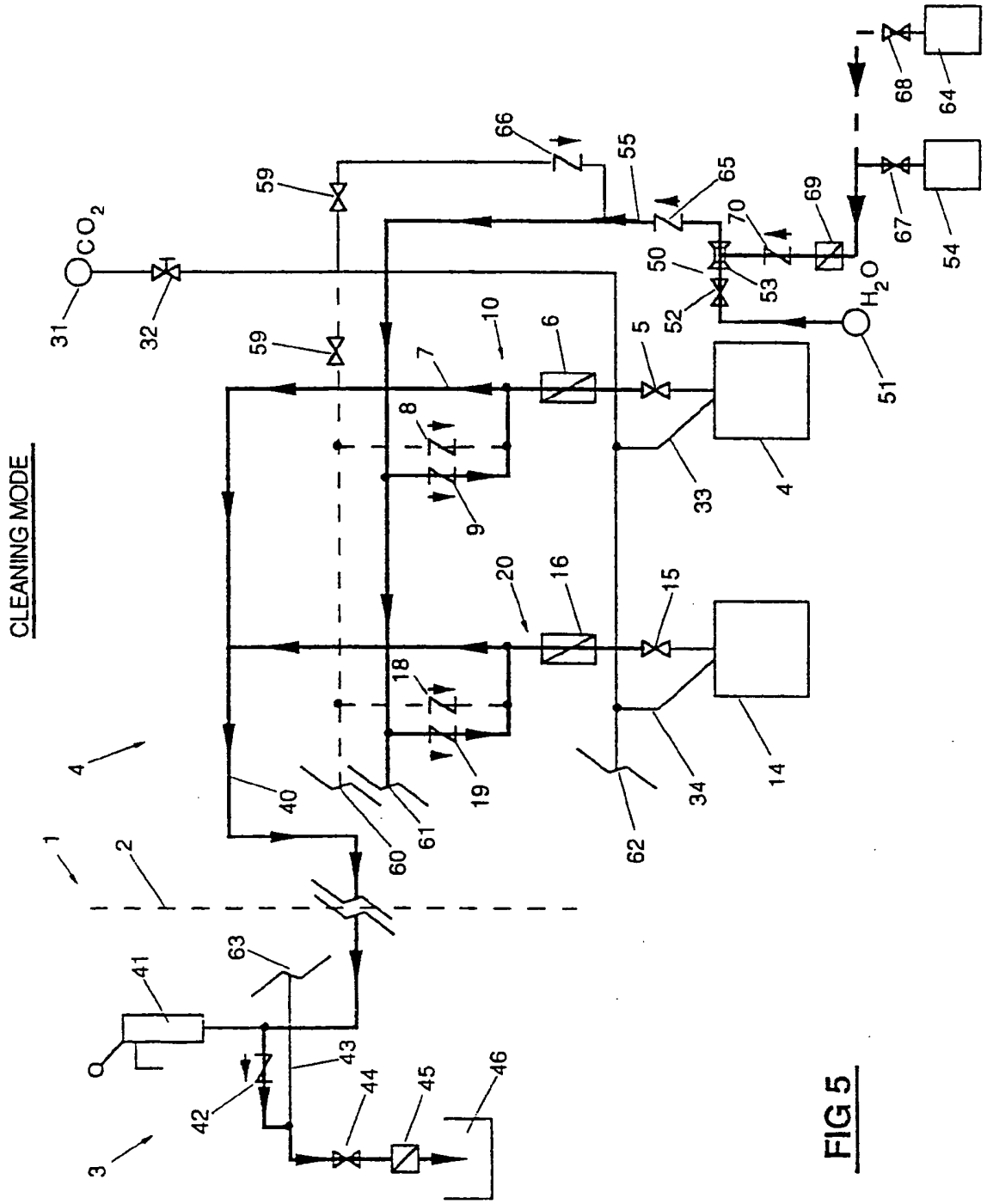
FIG 4


CLEANING MODE
CO_2
H_2O
O
1
2
3
4
5
6
7
8
9
10
14
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16
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31
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FIG 5

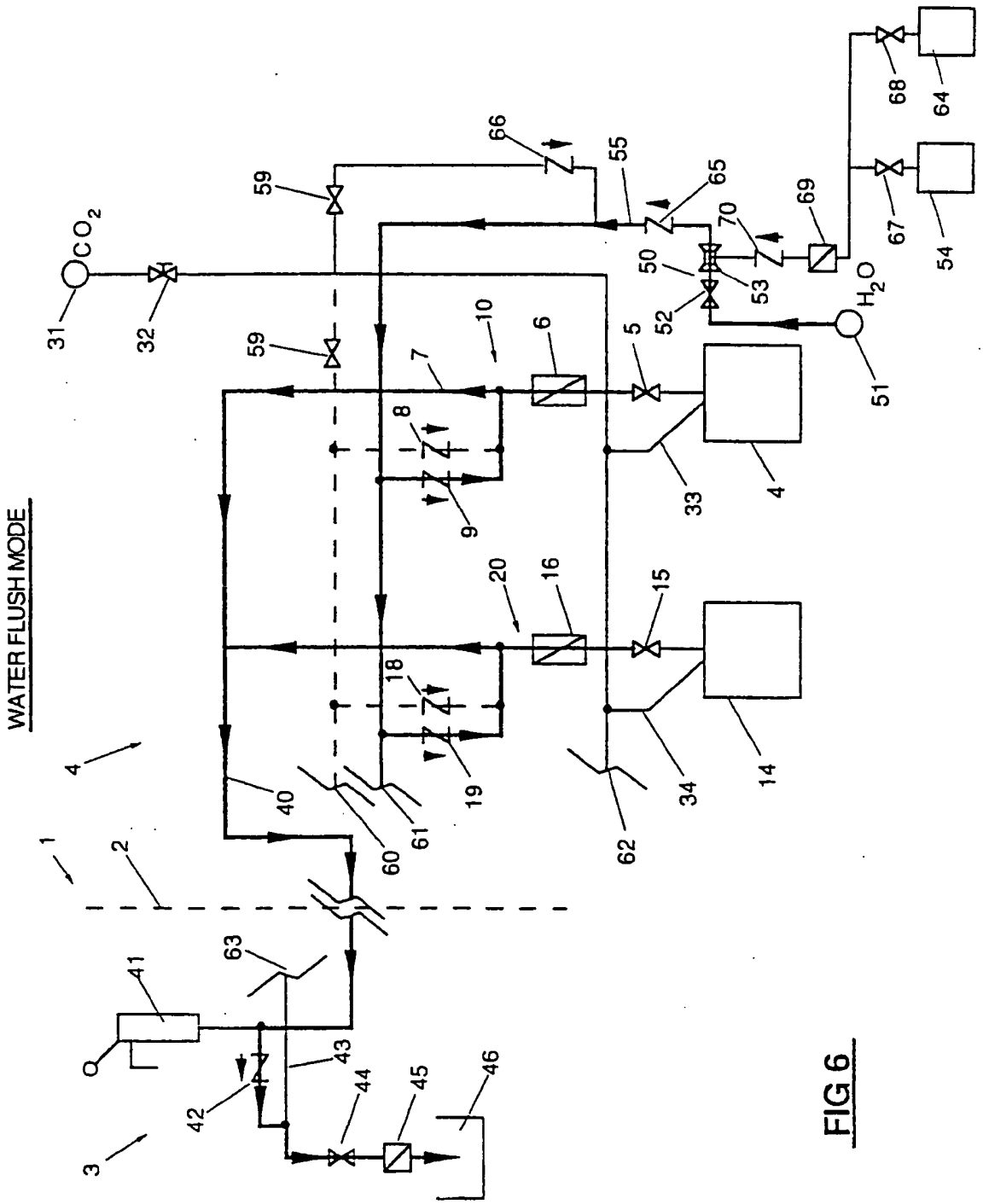
WATER FLUSH MODE
CO_2
H_2O
O
1
2
3
4
5
6
7
8
9
10
14
15
16
18
19
20
31
32
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FIG 6

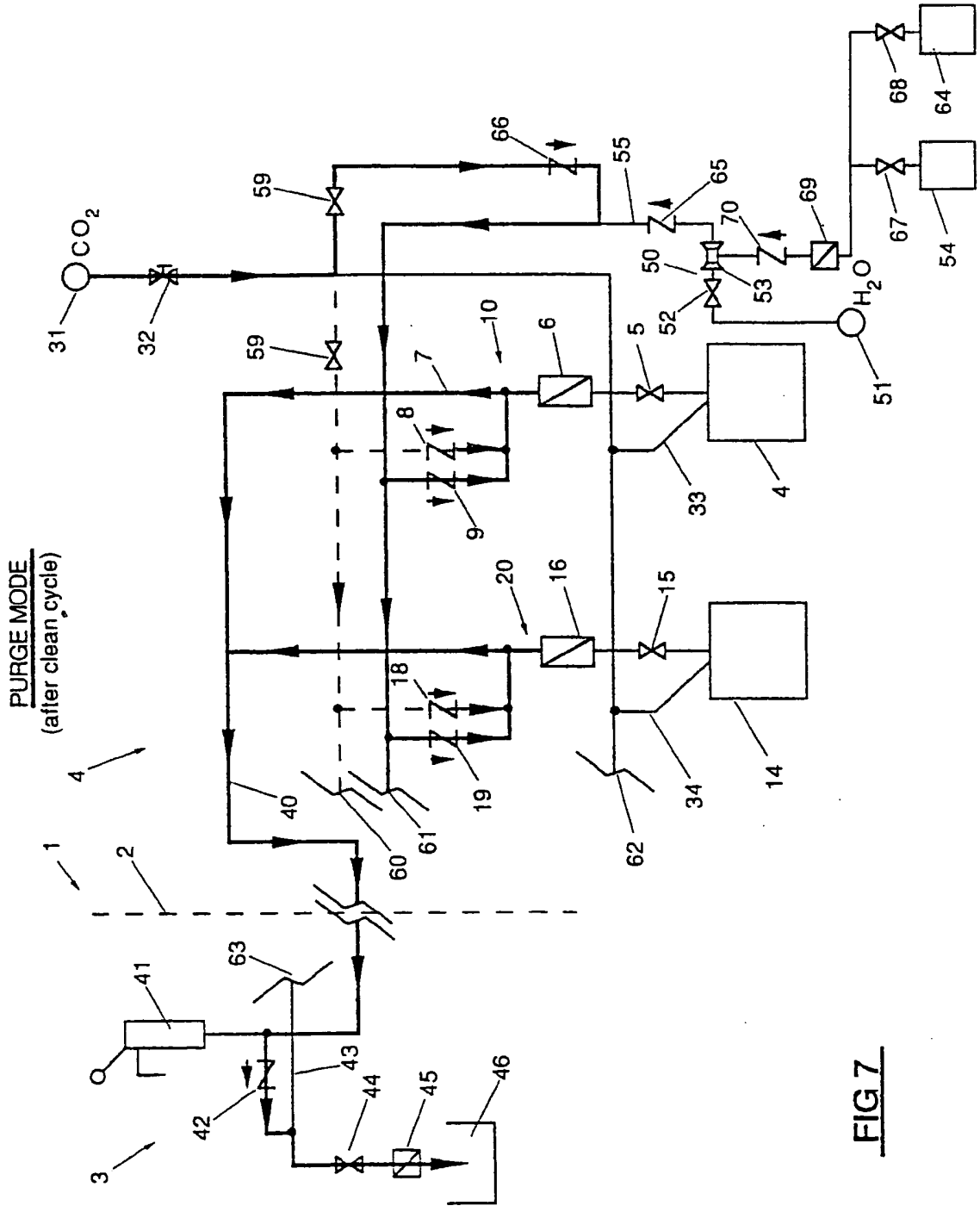
PURGE MODE
(after clean cycle)
CO_2
H_2O
1
2
3
4
5
6
7
8
9
10
14
15
16
18
19
20
31
32
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FIG 7

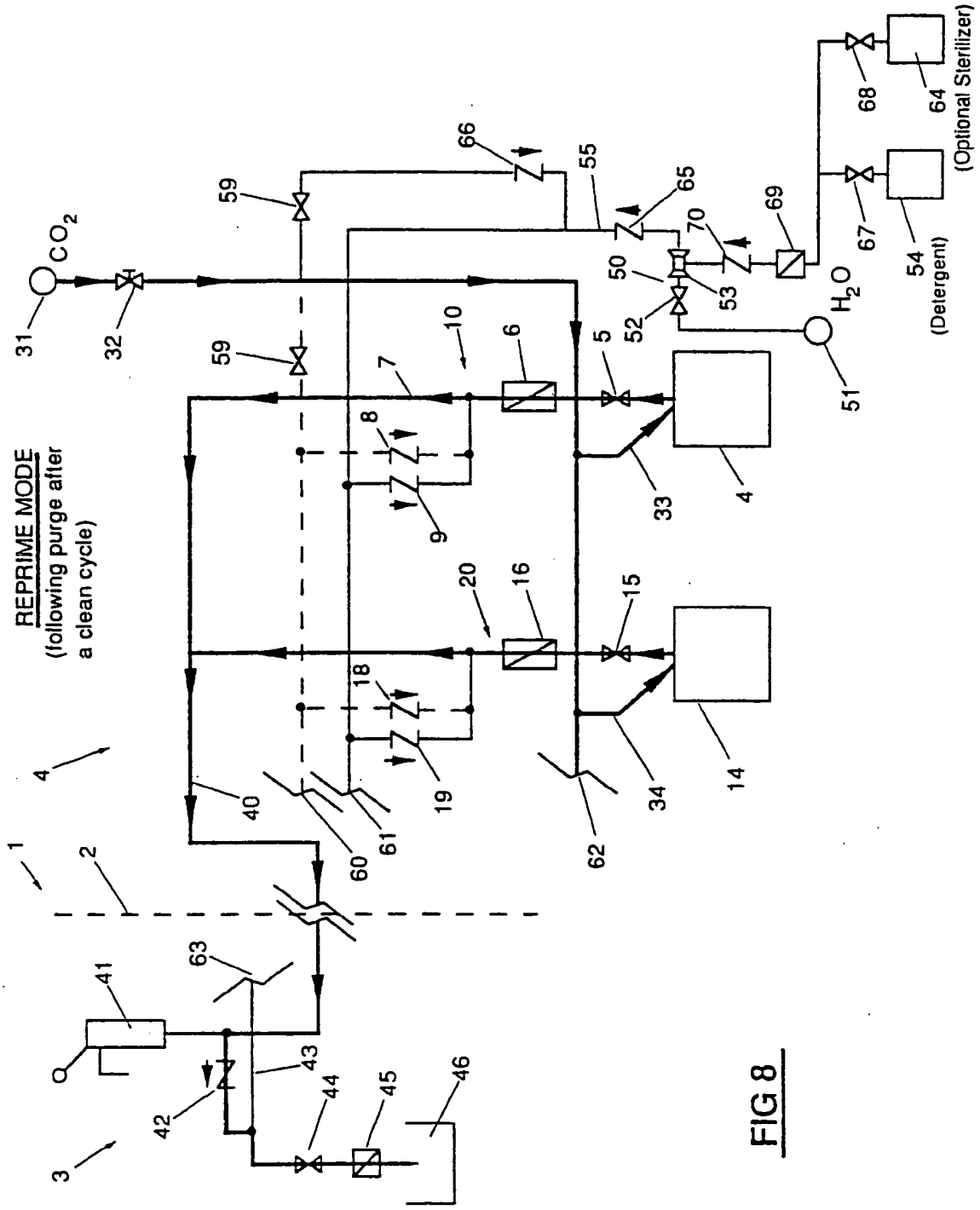

REPRIME MODE
(following purge after a clean cycle)
CO_2
H_2O
(Optional Sterilizer)
(Detergent)

FIG 8

FIG 9

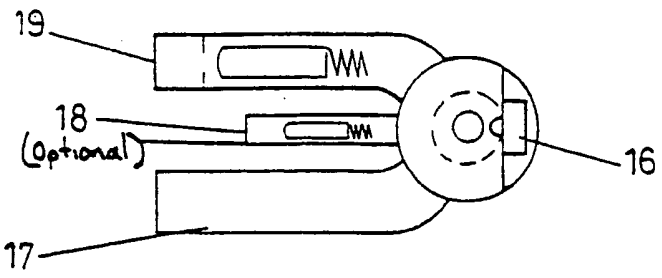
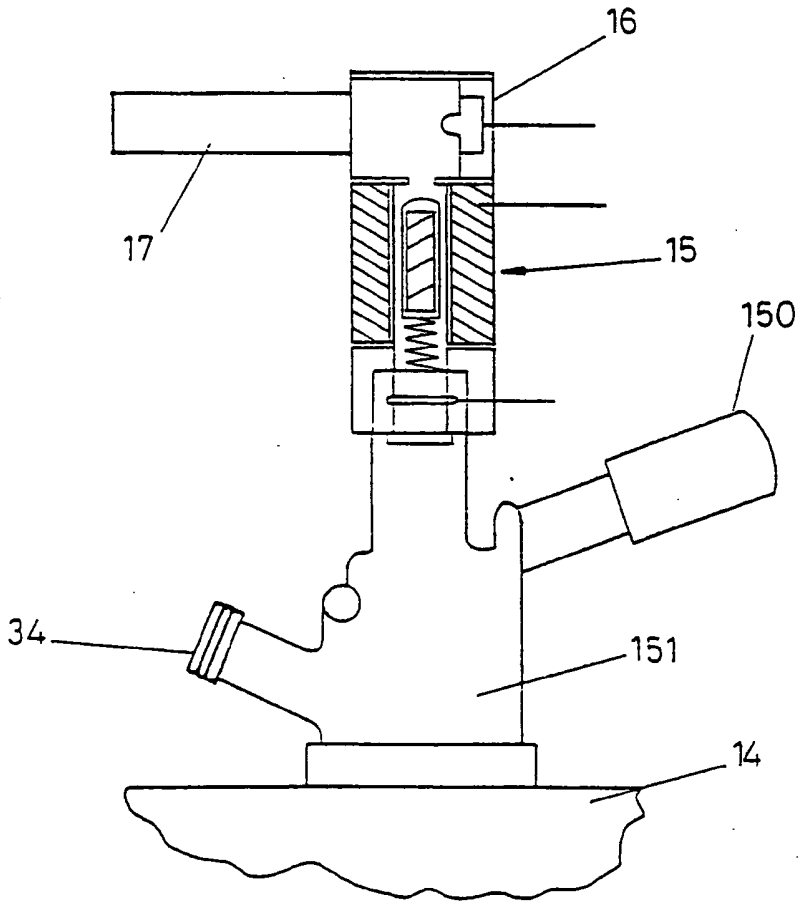
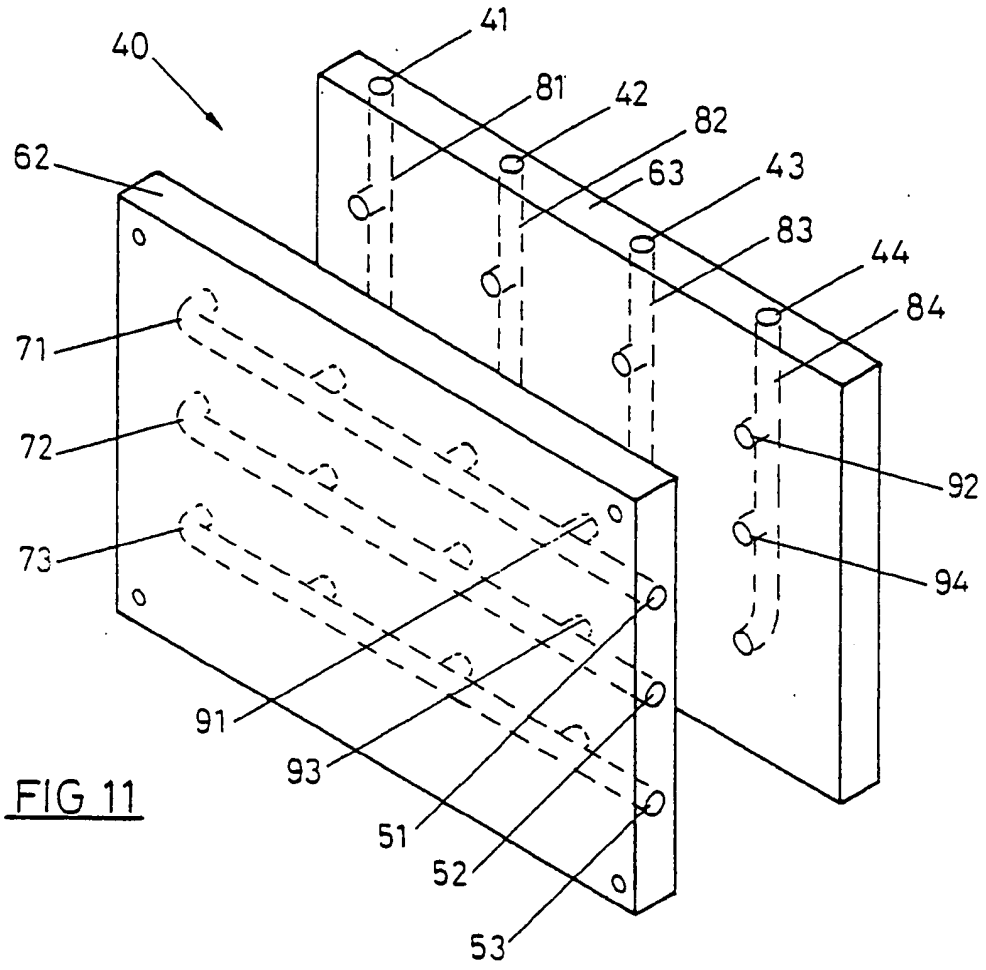


FIG 10

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93
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52
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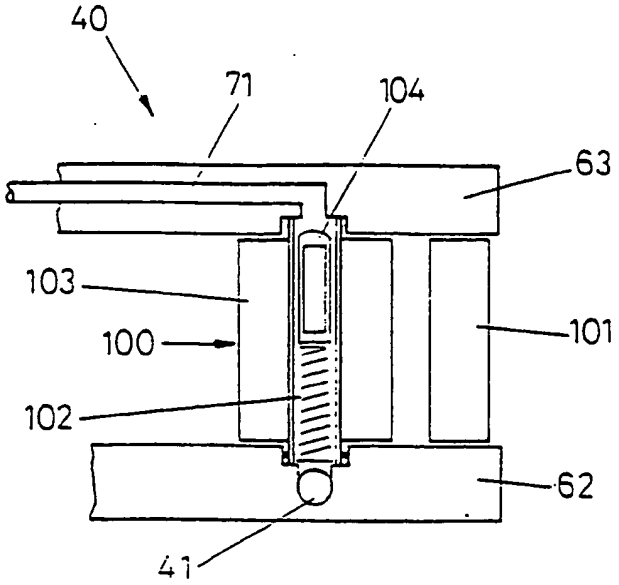
FIG 11

FIG 12


40
71
104
63
103
101
100
102
62
41

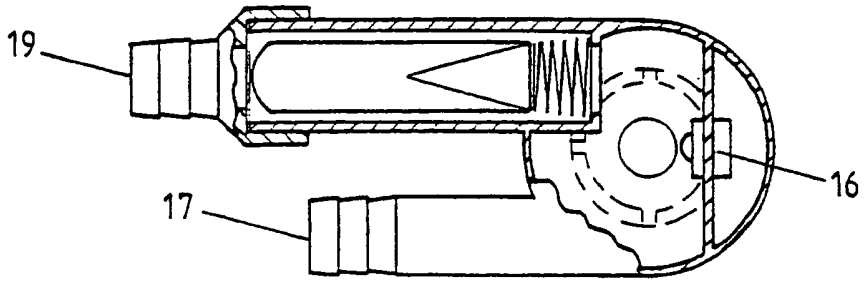


FIG 13

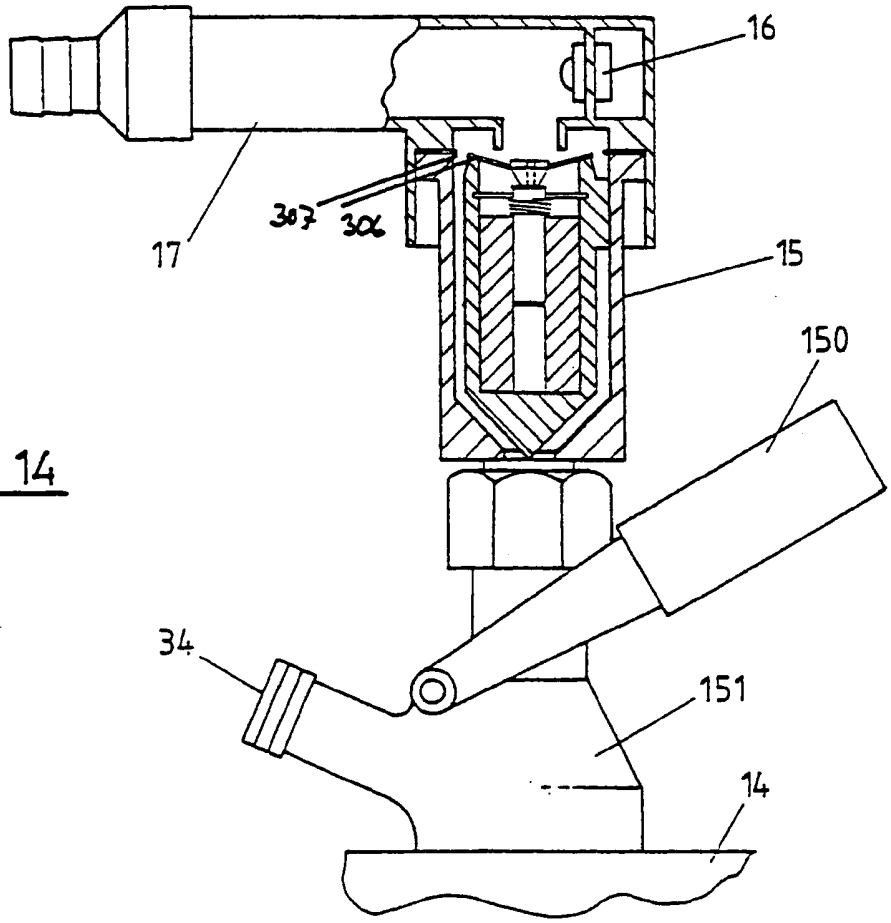


FIG 14

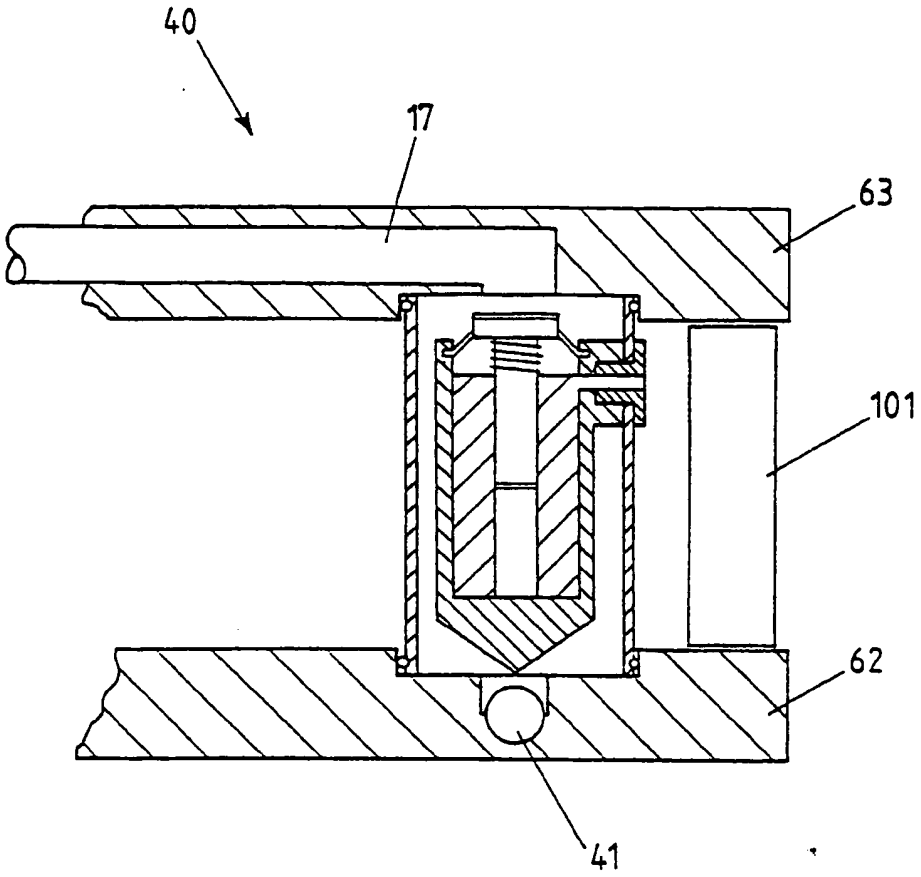


FIG 15

BNSDOCID: <WO_____9512543A1_I_>

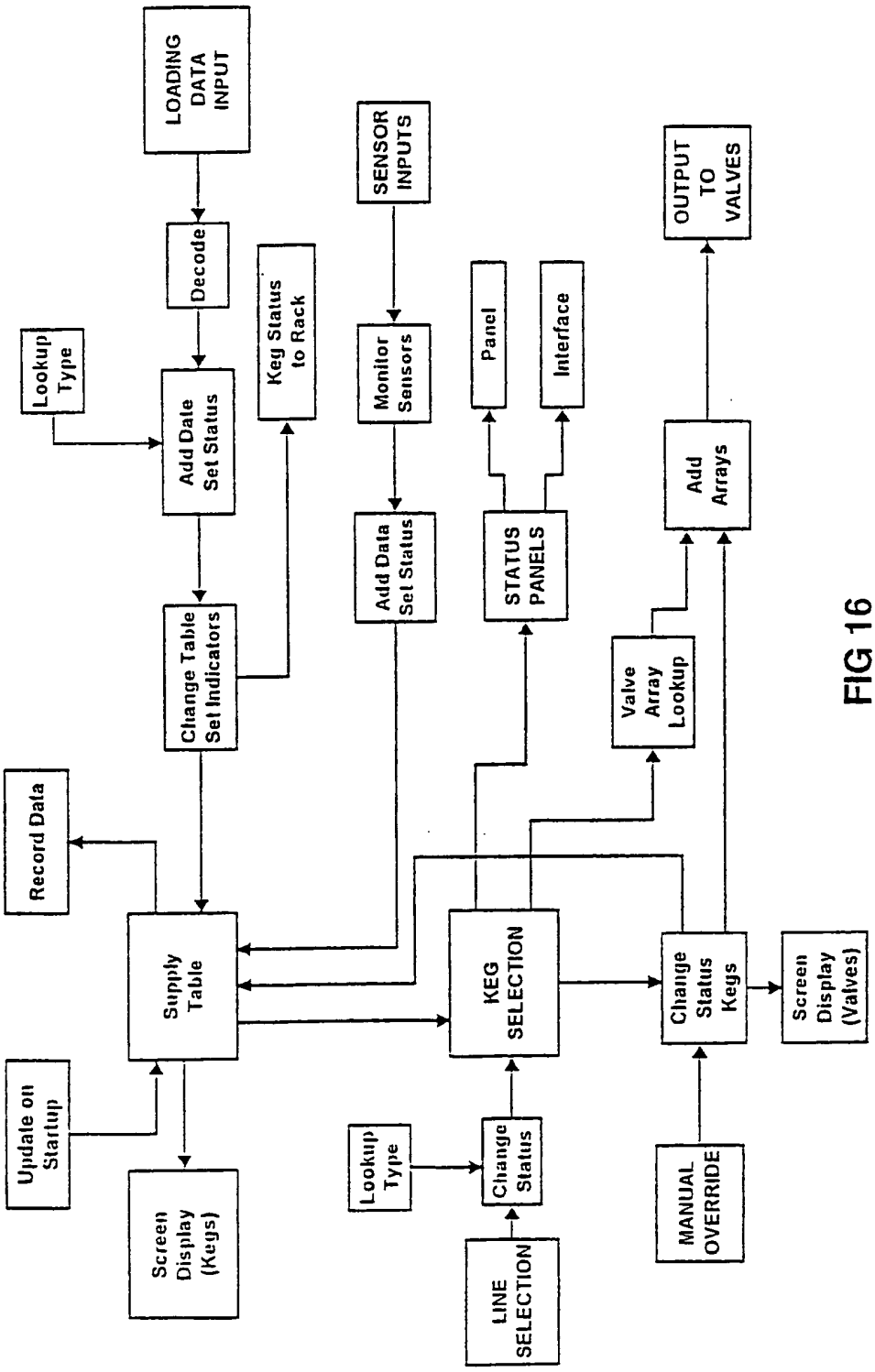

LOADING DATA INPUT
Decode
Lookup Type
Add Date Set Status
Key Status to Rack
Change Table Set Indicators
Record Data
Supply Table
Update on Startup
Screen Display (Keys)
SENSOR INPUTS
Monitor Sensors
Add Data Set Status
Panel
Interface
STATUS PANELS
KEG SELECTION
Lookup Type
Change Status
LINE SELECTION
OUTPUT TO VALVES
Add Arrays
Valve Array Lookup
Change Status Kegs
Screen Display (Valves)
MANUAL OVERRIDE

FIG 16

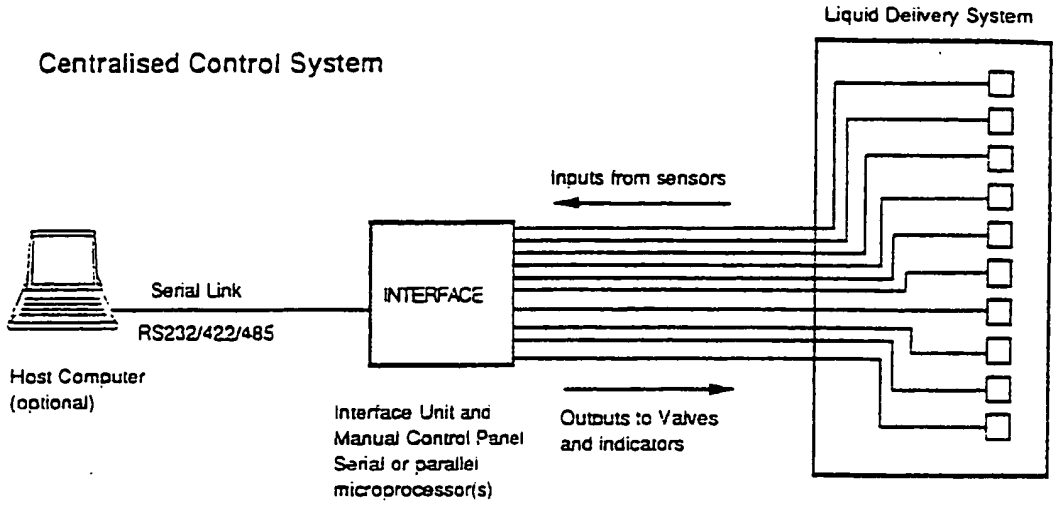

Centralised Control System
Liquid Delivery System
Inputs from sensors
Serial Link
RS232/422/485
INTERFACE
Host Computer
(optional)
Interface Unit and
Manual Control Panel
Serial or parallel
microprocessor(s)
Outputs to Valves
and indicators

FIG 17

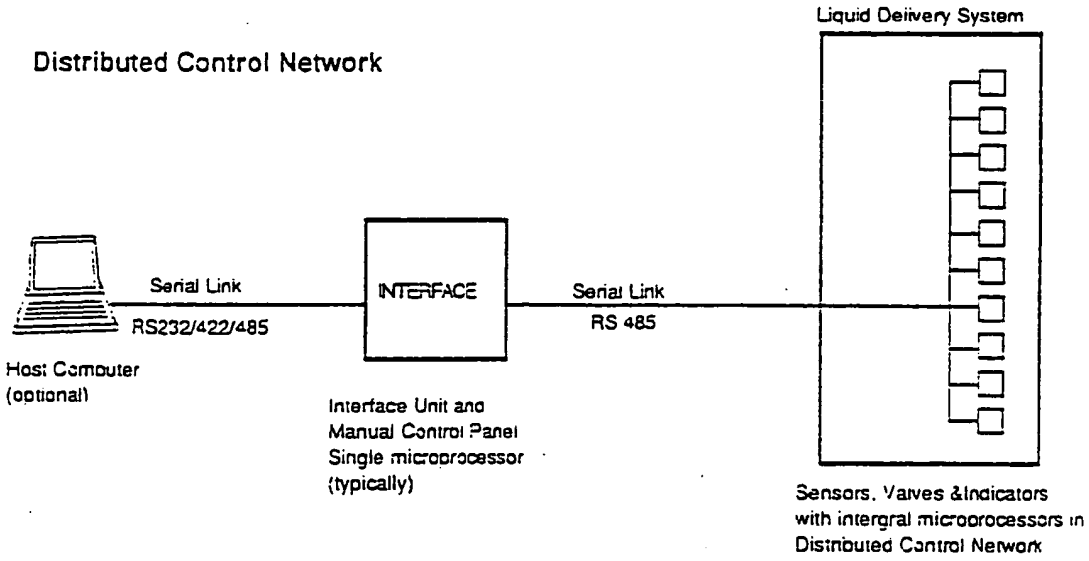

Distributed Control Network
Liquid Delivery System
Serial Link
RS232/422/485
INTERFACE
Serial Link
RS 485
Host Computer
(optional)
Interface Unit and
Manual Control Panel
Single microprocessor
(typically)
Sensors, Valves &Indicators
with intergral microprocessors in
Distributed Control Network

FIG 18

FIG 19

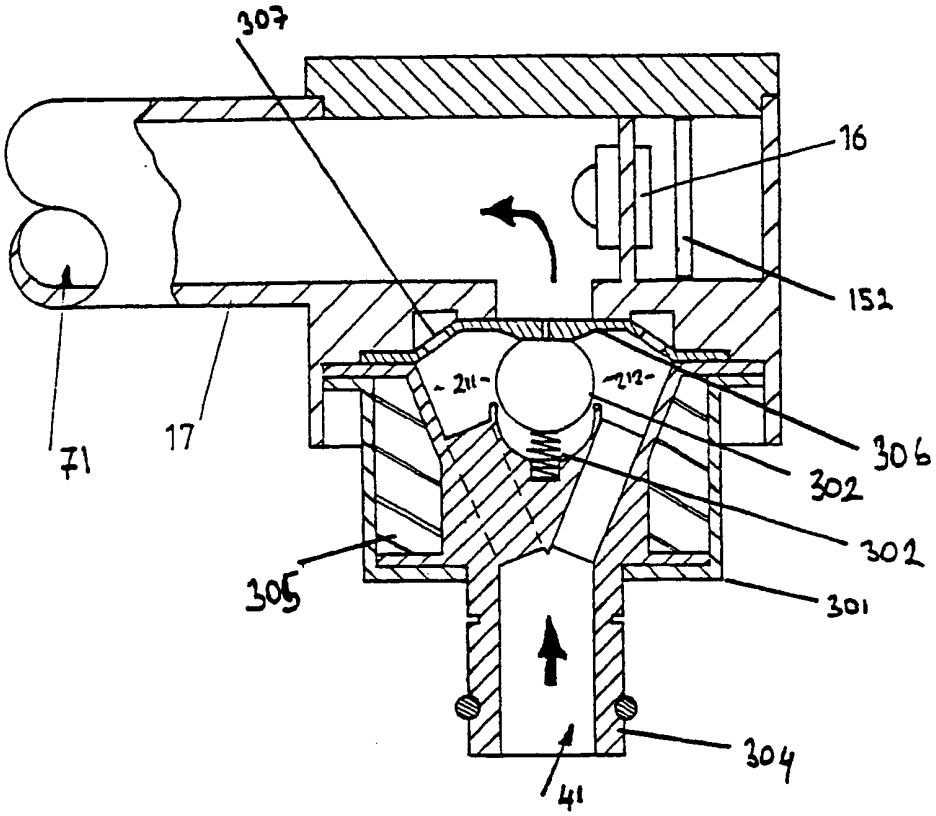
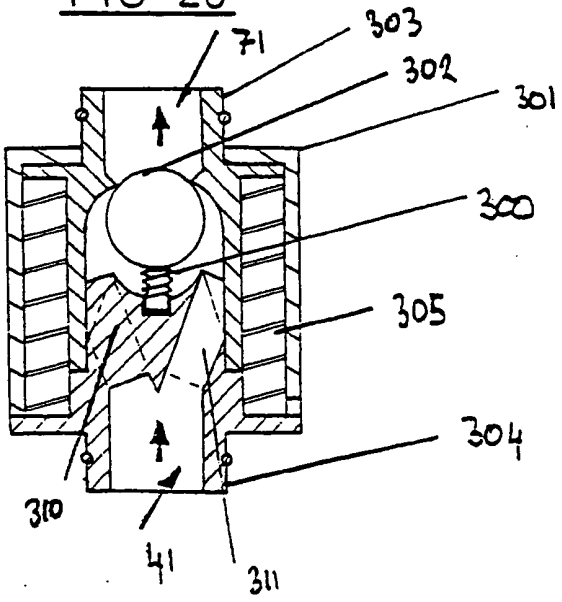

307
16
152
71
17
211
212
306
302
302
305
301
304
41

FIG 20


71
303
302
301
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305
304
310
41
311

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ 94/00123

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl.[6] B67D 1/07, 1/12; B08B 9/06; F16K 31/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: B67D 1/07, 1/12; B08B 9/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU: IPC as above, B67D 1/04

Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)
DERWENT: (B67D 1/00 or 1/08) and (clean, purge, sterilize, flush)
(F16K 31/06 or 31/10) and (pilot or (solenoid and ball)
(B67D 1/-) and ((valve and solenoid) or manifold)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	GB,A, 2185962 (HIGHLAND AUTOMATION LIMITED) 5 August 1987 (05.08.87) whole specification	1-7, 9-13, 33-37, 48-49, 61-68
X	GB,A, 2000485 (THE CORNELIUS COMPANY) 10 January 1979 whole specification	1-7, 9-13, 33-37, 48-49

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 January 1995 (25.01.95)	3 Feb 1995 (3.2.95)

Name and mailing address of the ISA/AU

AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION
PO BOX 200
WODEN ACT 2606
AUSTRALIA

Facsimile No. 06 2853929

Authorized officer

G.M. COX

Telephone No. (06) 2832484

Form PCT/ISA/210 (continuation of first sheet (2)) (July 1992) copbko

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
X	GB,A, 3878970 (NEZWORSKI) 22 April 1975 (22.04.75) whole specification	1-7, 9-13, 33-37, 48-49, 61-68
X	AU,A, 90139/82 (H DOWNEY (NSW) PTY LTD) 12 May 1983 (12.05.83) whole specification	1-7, 9-13, 33-37, 48, 49, 61-68
X	EP,A, 353104 (WHITFORD) 31 January 1990 (31.01.90) whole specification	1-7, 9-13, 33-37, 48, 49, 61-68
X	EP,A, 235437 (WHITFORD) 9 September 1987 (09.09.87) whole specification	1-7, 9-13, 33-37, 48, 49, 61-68
X	EP,A, 274370 (CARON N V) 13 July 1988 (13.07.88) whole specification	1-7, 9-13, 33-37, 48, 49, 61-68
X	US,A, 4275823 (CREDLE) 30 June 1981 (30.06.81) whole specification	1-7, 9-13, 33-37, 48, 49
X	US 4247018 (CREDLE) 27 January 1981 (27.01.81) whole specification	1-7, 9-13, 33-37, 48, 49, 61-68
E	GB,A, 2270301 (GUINESS BREWING WORLDWIDE LIMITED) 9 March 1994 (09.03.94) whole specification	1-7, 9-13, 33-37, 48, 49, 61-68
X	EP,A, 322729 (HUBER) 5 July 1989 (05.07.89) whole specification	1-7, 9-13, 33-37, 48, 49, 61-68
X	EP,A, 269152 (ODL SrL) 1 June 1988 (01.06.88) whole specification	1-7, 9-38, 45, 46, 48, 49, 61-68
E	EP,A, 598621 (TKCS LIMITED) 25 May 1994 (25.05.94) whole specification	1-7, 9-13, 33-37, 48, 49, 61-68
X	AU,A, 75269/91 (The Commonwealth Industrial Gases Limited) 11 June 1992 (11.06.92) whole specification	14-32, 38, 45, 46, 50-66
X	DE,A, 4025624 (MALDONADO) 14 February 1991 (14.02.91) whole specification	14-32, 38, 45, 46, 50-60

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
X	GB,A, 2140121 (SINGLETON) 21 November 1984 (21.11.84) whole specification	14-32, 38,45, 46, 50-60
X	EP,A, 409305 (TAPCLEAN B V) 23 January 1991 (23.01.91) whole specification	14-32, 38, 45, 46, 50-60
X	GB,A, 2260795 (WEST) 28 April 1993 (28.04.93) whole specification	14-32, 38, 45, 46, 50-60
X	AU,B, 29750/84 (561712) (MIRABIGE) 3 January 1985 (03.01.85) whole specification	14-32, 38, 45, 46, 50-60
X	US,A, 4572230 (MIRABILE) 25 February 1986 (25.02.86) whole specification	14-32, 38, 45, 46, 58-60
X	US,A, 5090440 (LADOUCEUR) 25 February 1992 whole specification	14-32, 38, 45, 46, 50-60
X	GB,A, 2166212 (HUGHES) 30 April 1986 (30.04.86) whole description	14-32, 38, 45, 46, 58-60
X	US,A, 4941593 (HICKS) 17 July 1990 (17.07.90) whole description	14-32, 38, 45, 46, 50-60
X	GB,A, 2165525 (PORTER LANCASTRIAN LTD (UK)) 16 April 1986 (16.04.86) whole specification	61-68
X	GB,A, 2180917 (MACDONALD) 8 April 1987 (08.04.87) whole specification	61-68
X	US,A, 4582226 (DOAK) 15 April 1986 (15.04.86) whole specification	61-68
X	US,A, 3828818 (HUNT) 13 August 1974 (13.08.74) whole specification	69-74, 76
X	US,A, 3856260 (GIORDANO) 24 December 1974 (24.12.74) whole specification	69-76
X	US,A, 3887162 (ANTONI) 3 June 1975 (03.06.75) whole specification	69-76
X	EP,A, 294223 (COCA-COLA CO) 7 December 1988 (07.12.88) whole specification	69, 71-76
X	WO,A, 92/09522 (EBTECH INC) 11 June 1992 (11.06.92) whole specification	69, 71-76

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
X	AU,B, 45982/79 (528502) (AUTOMATIC SWITCH COMPANY) 11 October 1979 (11.10.79) whole specification	69, 71-76
X	AU,B, 14050/55 (211070) (GOYEN) 28 February 1957 (28.02.57) whole specification	69, 71-76
X	AU,B, 39127/78 (520279) (COWARD) 28 February 1980 (28.02.80) whole specification	69, 71-76
X	AU,A, 43376/85 (SEALED POWER CORP) 16 January 1986 (16.09.86) whole specification	69-76

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ 94/00123

Box I **Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)**

This international search report has not established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claim Nos.: 8, 39, 44
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

Claims 8 and 44 rely for their description upon a model number of a solid state liquid level switch available from a NZ company. Claim 39 is simply meaningless.

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II **Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are five inventions:

1 Claims 1-7, 9-13, 33-37, 48-49 share a first special technical feature of the "logic means". Claims 40-43 and 47 share a second special technical feature of the "assembly". As the claims relating to the second special technical feature could be searched without effort qualifying an additional fee, this authority did not invite payment of any additional fee for these claims.

2 Claims 14-32, 38, 45, 46, 50-60 are directed to cleaning, sterilizing or pumping aspect. This forms the third special technical feature.

3 Claims 61 to 68 are directed to a gas pressurized liquid dispensing system in which the connection of the multiple containers and multiple taps by an array of remotely operated valves forms the fourth special technical patent.

4 Claims 69 to 76 are directed to a solenoid valve. This forms the fifth special technical feature.

Since the above-mentioned groups of claims do not share any of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly the international application doejs not relate to one invention or to a single inventive concept.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically

claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

BNSDOCID: <WO_____9512543A1_I_>

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Member
GB 2185962	
GB 2000485	AT 4313/78, CA 1088471, DE 2825824, US 4143793, US 4305527, US 4377246, US 4413752, US 4560089
AU 90139/82	
US 3878970	
EP 353104	
EP 235437	
EP 274370	BE 906032
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